



Chapter 4. Energy Efficiency Actions

Saving energy through energy efficiency improvements can cost less than generating, transmitting, and distributing energy from power plants and provides multiple economic and environmental benefits. States have adopted a number of policies that support cost-effective energy efficiency programs by removing key market, regulatory, and institutional barriers that hinder investment in cost-effective energy efficiency by consumers, businesses, utilities, and public agencies. This chapter presents in-depth descriptions of four policies that states have used to support greater investment in and adoption of energy efficiency.

The policies summarized in Table 4.1 on page 4-2 were selected from among a larger universe of energy efficiency strategies because of their proven effectiveness and their successful implementation by a number of states. The information presented in each policy description is based on the experiences and best practices of states that are implementing the programs, as well as on other sources, including local, regional, and federal agencies and organizations, research foundations and nonprofit organizations, universities, and utilities.

Table 4.1 also lists examples of some of the states that have implemented programs for each policy. States can refer to this table for an overview of the policies described in this chapter and to identify other states that they may want to contact for additional information about their energy efficiency programs. The *For More Information* column shows the *Guide to Action* section where each in-depth policy description is located.

In addition to these four policies, there are a number of other policies that states are adopting to (1) ensure energy efficiency programs are adequately funded, (2) allow energy efficiency to compete in the energy marketplace, (3) integrate energy efficiency

Clean Energy Policies

Type of Policy	For More Information
State Planning and Incentive Structures	
Lead by Example	Section 3.1
State and Regional Energy Planning	Section 3.2
Determining the Air Quality Benefits of Clean Energy	Section 3.3
Funding and Incentives	Section 3.4
Energy Efficiency Actions	
Energy Efficiency Portfolio Standards	Section 4.1
Public Benefits Funds for Energy Efficiency	Section 4.2
Building Codes for Energy Efficiency	Section 4.3
State Appliance Efficiency Standards	Section 4.4
Energy Supply Actions	
Renewable Portfolio Standards	Section 5.1
PBFs for State Clean Energy Supply Programs	Section 5.2
Output-Based Environmental Regulations to Support Clean Energy Supply	Section 5.3
Interconnection Standards	Section 5.4
Fostering Green Power Markets	Section 5.5
Utility Planning and Incentive Structures	
Portfolio Management Strategies	Section 6.1
Utility Incentives for Demand-Side Resources	Section 6.2
Emerging Approaches: Removing Unintended Utility Rate Barriers to Distributed Generation	Section 6.3

measures into energy and air quality planning, and (4) lead by example by improving energy efficiency and lowering energy costs within state government operations. These policies are addressed in other sections of the *Guide to Action* as follows.

- *Lead by Example* programs provide opportunities to improve energy efficiency within state buildings, fleets, and equipment purchases (see Section 3.1).
- *State and Regional Energy Planning* activities help states identify opportunities to incorporate energy efficiency measures as a way to meet future load growth and address other energy related concerns (see Section 3.2).
- *Determining the Air Quality Benefits of Clean Energy* describes how to incorporate the emission reductions from energy efficiency into air quality planning and related activities (see Section 3.3).
- *Funding and Incentives* describes additional ways states provide funding for energy efficiency through loans, tax incentives, and other funding mechanisms (see Section 3.4).
- *Portfolio Management Strategies* include proven approaches, such as Integrated Resource Planning (IRP), that place a broad array of supply and demand options on a level playing field when comparing and evaluating them in terms of their ability to meet projected energy demand. These strategies highlight and quantify the value of energy efficiency and clean distributed generation as a resource to meet projected load growth (see Section 6.1).
- *Utility Incentives for Demand-Side Resources* presents a number of approaches (including decoupling and performance incentives) that remove disincentives for utilities to consider energy efficiency, renewable energy, and clean distributed generation (DG) equally with traditional electricity generation investments when making electricity market resource planning decisions (see Section 6.2).

Table 4.1: Energy Efficiency Policies and Programs

Policy	Description	State Examples	For More Information
Energy Efficiency Portfolio Standards (EEPS)	Similar to Renewable Portfolio Standards (see Section 5.1), EEPS direct energy providers to meet a specific portion of their electricity demand through energy efficiency. Seven states have direct or indirect EEPS requirements.	CA, IL, NJ, NV, PA, TX	Section 4.1
Public Benefits Funds (PBFs) for Energy Efficiency	PBFs for energy efficiency are pools of resources used by states to invest in energy efficiency programs and projects and are typically created by levying a small charge on customers' electricity bills. Seventeen states and Washington, D.C. have established PBFs for energy efficiency.	CA, NY, OR, WI	Section 4.2
Building Codes for Energy Efficiency	Building energy codes establish energy standards for residential and commercial buildings, thereby setting a minimum level of energy efficiency and locking in future energy savings at the time of new construction or renovation. More than 40 states have implemented some level of building codes for residential buildings and/or commercial buildings.	AZ, CA, OR, TX, WA	Section 4.3
State Appliance Efficiency Standards	State appliance efficiency standards set minimum energy efficiency standards for equipment and appliances that are not covered by federal efficiency standards. Ten states have adopted appliance standards.	CA, CT, NJ, NY	Section 4.4

4.1 Energy Efficiency Portfolio Standards

Policy Description and Objective

Summary

A growing number of states are adopting EEPS,⁸ or similar provisions, to ensure that cost-effective energy efficiency measures are used to help offset growing electricity demand. Similar to renewable portfolio standards (RPS) already in place in 21 states and Washington, D.C. (see Section 5.1, *Renewable Portfolio Standards*), EEPS require that energy providers meet a specific portion of their electricity demand through energy efficiency. EEPS are intended to help overcome the various barriers that keep utilities and other players from investing in cost-effective energy efficiency that several studies predict could meet up to 20% of the nation's energy demand, or about half of the expected demand growth (Nadel et al. 2004). States have found that establishing explicit targets, based on sound analysis of technical and economic potential, can help reduce energy demand as well as lower electricity prices, cut emissions, help address concerns with system reliability, and provide other energy-related benefits (see Chapter 1, *Introduction and Background*, for more on the benefits of energy efficiency).

EEPS designs vary by state and include targets that range from the equivalent of a 10% to a 50% reduction in energy demand growth. EEPS were first set in Texas as energy efficiency goals under their 1999 restructuring rules. Texas required utilities to use energy efficiency to meet 10% of their demand growth in by 2004. California adopted annual energy savings goals for 2004 to 2013 for their four largest utilities covering both electricity and natural gas providers (the only state to include both). California's targets, set in terms of kilowatt-hours (kWh) and therms saved based on percentages of total sales, are

Effectively designed Energy Efficiency Portfolio Standards (EEPS) can help ensure that cost-effective energy efficiency opportunities are pursued to help manage electricity demand growth, lower overall and peak electricity prices, cut emissions, and address reliability concerns.

expected to reduce demand growth by more than 50% for electricity and more than 40% for natural gas. Connecticut recently required its energy providers to meet a portion of their supply (i.e., 1% in 2007 growing to 4% by 2010) from distributed resources, including energy efficiency from commercial and industrial facilities, load management, and combined heat and power (CHP). Illinois recently adopted voluntary EEPS that call for energy efficiency to meet 25% of electricity demand growth by 2015. New Jersey is examining EEPS based on kWh saved as a component of its public benefits fund (PBF) program (see Section 4.2, *Public Benefits Funds for Energy Efficiency*). Pennsylvania includes energy efficiency as one option for meeting its Alternative Energy Portfolio Standard. In at least two states, Hawaii and Nevada, utilities can use energy efficiency to meet some or all of their requirements under an RPS (see Section 5.1, *Renewable Portfolio Standards*).

While the benefits of energy efficiency measures are well documented, Texas is the one state in which standards have been in place long enough to measure results from an EEPS approach. The 10% reduction in load growth goal was exceeded in 2004 and, in that year, Texas saved more than 400 million kWh at a cost of \$82 million, for a net benefit of \$76 million to date (Gross 2005b). The cumulative effect of California's 10-year EEPS is estimated, by 2013, to result in annual savings of over 23,000 gigawatt-hours (GWh) electricity and 400 million therms natural gas. Peak electricity demand savings are expected to top 4,800 megawatts (MW) (CPUC 2004).

⁸ In this *Guide to Action*, the term "Energy Efficiency Portfolio Standards" covers a variety of terms including portfolio standards and resource acquisition requirements and goals.

The Illinois EEPS is estimated to save more than 5,600 GWh by 2017. The energy savings will reduce energy costs for consumers, including significant reductions in prices for natural gas.

Objective

EEPS are intended to overcome barriers to investing in cost-effective energy efficiency. A number of recent studies have indicated that technically feasible, economically viable, but as yet untapped, energy efficiency measures could meet up to 20% of the nation's energy demand, or about half of the expected demand growth (Nadel et al. 2004). However, in many states, market barriers, regulatory disincentives, or insufficient information about the benefits of energy efficiency keep utilities and other players from investing in cost-effective energy efficiency to its full potential. States have found that establishing an explicit, mandatory target, based on sound analysis of technical and economic potential, can help overcome these barriers. In some cases, states have combined EEPS with additional policy measures such as PBFs and rate adjustments that decouple utility sales and profits to help further address these barriers. (See Section 6.2, *Utility Incentives for Demand-Side Resources*.)

Benefits

By increasing investments in cost-effective energy efficiency, EEPS can achieve modest to significant reductions in both electricity and natural gas (depending upon the level of the target). Associated with the reduction in power demand are additional benefits including: lower energy bills, reduced air pollutant and greenhouse gas emissions, reduced strain on power grids, and lower wholesale energy prices (see Chapter 1, *Introduction and Background*, for more on the benefits of energy efficiency). Beyond the benefits tied to reduced energy use, states have found EEPS have a number of particular advantages as a policy approach including: simplicity, cost-effectiveness, specificity, economies of scale, and economies of scope.

- *Electricity Savings.* The amount of electricity savings from EEPS depend on the level and timing of

the EEPS targets, how the target is expressed, the actual level of demand growth, and other market forces. In the electricity sector, EEPS goals currently range from 10% of forecast electricity sales *growth* (e.g., in Texas) to almost 1% of total electricity *sales* annually (e.g., in California where this amounts to more than 50% of projected growth). See Table 4.1.1 on page 4-6 for a summary of current targets.

- *Natural Gas Savings.* EEPS for natural gas providers, such as the one adopted by California, will help reduce direct natural gas use. In addition, EEPS for electricity can help reduce natural gas used in electricity generation. In general, one unit of electricity saved through energy efficiency saves about three units of natural gas used for electricity generation due to generation and transmission losses. This makes saving natural gas through electric energy efficiency very cost-effective. A recent study shows that the majority of cost-effective natural gas savings would come through electricity end-use efficiency investments (Elliot et al. 2003).
- *Simplicity.* EEPS create a straightforward resource acquisition target for energy providers.
- *Cost-Effectiveness.* Setting an energy efficiency requirement without explicitly setting aside a pool of funds challenges electricity providers to meet the goal in the most cost-efficient manner. This can be reinforced through appropriate funding and cost recovery mechanisms, as noted on page 4-8.
- *Specificity.* By articulating a specific, numeric target, EEPS can be effective in illuminating how much energy efficiency will contribute to reaching goals of energy demand reduction as well as emission reductions and other public policy goals.
- *Economies of Scale.* The macro-level targets inherent in EEPS allow energy providers to aggregate savings across enough end-uses and sectors to meet the overall savings goals cost-effectively. This helps address a fundamental barrier to energy efficiency resource development: the distributed nature of energy efficiency resources. Securing substantial energy efficiency gains in every end-use and use sector involves millions of homes, offices, factories, and other facilities and thus can

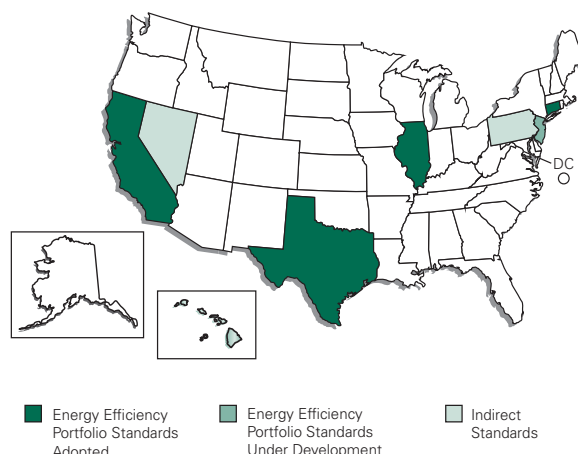
be difficult when approached at a micro-level. States sometimes designate an aggregator, such as a distribution utility, with the responsibility for reaping these savings as a means of overcoming this obstacle. On the administration side, EEPS allow a state to bundle energy efficiency opportunities, and set overall goals for procuring energy efficiency within the state, coordinating the process and simplifying compliance evaluation.

States with Energy Efficiency Portfolio Standards

As noted in the previous section, EEPS designs vary by state and include targets that range from the equivalent of a 10% to a 50% reduction in energy demand growth. Seven states have adopted EEPS, either directly or indirectly (see Figure 4.1.1). Texas and California have EEPS in place; Connecticut recently enacted a distributed RPS that includes energy efficiency, load management, and CHP; Illinois recently adopted a voluntary EEPS; New Jersey is examining EEPS as a component of its PBF program; Pennsylvania includes energy efficiency as one option for meeting its Alternative Energy Portfolio Standard (AEPS); and in Hawaii and Nevada, utilities can use energy efficiency to meet some or all of their requirements under an RPS. In addition, several states with PBFs have conducted energy efficiency analyses, potential studies, and goal-setting exercises, but energy efficiency goals have not been prominently featured. See Table 4.1.1 on page 4-6 for more details.

EEPS policies have been developed primarily in states with restructured utility markets, generally as a partial replacement for the Integrated Resource Planning (IRP) requirements that were removed as part of restructuring. California, which suspended its restructuring policy after its 2001 electricity experience, is an exception, as are Hawaii and Nevada. In restructured markets, the EEPS approach is being integrated into broader energy resource planning activities such as portfolio management, described in Section 6.1, *Portfolio Management Strategies*. Under the IRP framework in place in most traditionally regulated states, efficiency investment levels are typically based on the total level of savings that can be

Figure 4.1.1: States That Have Adopted or Are Developing EEPS



Source: EPA 2005.

acquired within the bounds of economic criteria. States use similar kinds of economic analysis to develop estimates of efficiency potential in the process of setting EEPS goals. The difference is that the EEPS process tends to set goals in an aggregate, top-down fashion, whereas regulated utility programs are typically developed on an individual, bottom-up basis.

Designing an Effective EEPS

A number of key design issues have emerged from EEPS efforts to date or are central to the design of any efficiency program, including: who participates in different aspects of the process; how to set a target, including its coverage, timing, and duration as well as what analysis to consult; potential funding sources; and how the policy interacts with federal and other state policies. Although there are only a few EEPS in place, they share a number of characteristics that other states have considered when designing a program. States have also drawn upon their own past experience with designing and administering energy efficiency programs.

Participants

- *State Legislatures.* In many states, legislation is required to enable the setting of EEPS targets.

Table 4.1.1: Current and Pending State EEPS Policies

State	EEPS Description	Applies to	Savings Target	Time Frame
California	Sets specific energy and demand savings goals	Investor-owned utilities (IOUs)	Savings goals set for each program year from 2004 to 2013 The savings target for program year 2013 is: <ul style="list-style-type: none"> 23,183 GWh 4,885 MW peak 444 million therms 	2004-2013 Annual megawatt-hours (MWh), MW, and therm savings adopted for each of these years
Connecticut	Includes energy efficiency at commercial and financial facilities as one eligible source under its Distributed RPS (also includes combined heat and power and load management programs)	IOUs	Savings goals set for the beginning of each program year:	
			1%	2007
			2%	2008
			3%	2009
Hawaii	Allows efficiency to qualify as a resource under RPS requirements	IOUs	20% of kWh sales (overall RPS target, energy efficiency portion not specified)	2020
			10%	2006–2008
			15%	2009–2011
			20%	2012–2014
Illinois	Will set goals as percentage of forecast load growth	IOUs	25%	2015–2017
			1814 GWh (four-year total)	2005–2008
			Energy efficiency can meet up to 25% of the energy provider's portfolio standard:	
			6%	2005–2006
Nevada	Redefines portfolio standard to include energy efficiency as well as renewable energy	IOUs	9%	2007–2008
			12%	2009–2010
			15%	2011–2012
			18%	2013–2014
Pennsylvania	Includes energy efficiency as part of a two-tier AEPS	IOUs	20%	2015 and thereafter
			4.2%	Years 1–4
			6.2%	Years 5–9
			8.2%	Years 10–14
Texas	Sets goals as percentage of forecast load growth	IOUs	10.0%	Years 15 and thereafter
			10%	2004 and thereafter

Note: See *Examples of Legislation/Regulation* for each state on page 4-16.

Legislatures have either set EEPS targets in legislative language or directed an executive agency to do so. In either case, states have clearly designated an executive agency to work out details and administer implementation of the targets.

- *Public Utility Commissions (PUCs)*. PUCs in many other states have the authority to set EEPS directly. PUCs are a likely agency to administer EEPS, given their oversight role of utility markets.
- *Utilities*. Given the direct impact on the utility sector, legislatures and PUCs have sought input on the impacts on utility profitability and ongoing operations when designing an EEPS, as well as developing accompanying ratemaking and other regulatory policies. Utilities may directly implement the ensuing energy efficiency programs or states may require them to utilize energy service companies. Efforts typically include standard offer or market transformation programs (see description of Texas program on page 4–13 for more detail).
- *Customers/General Public*. States have created public comment processes to help inform topics such as potential costs/economic impacts and benefits, including health benefits and other effects of reduced emissions.
- *Public Interest Organizations*. Groups representing consumers, environmental interests, and other public interests have been involved to offer technical expertise as well as public perspectives.

Setting a Target

Under EEPS, a state utility commission or other regulatory body specifies numerical energy savings targets that electricity service providers must meet, on an annual and sometimes cumulative basis. EEPS can be set as a percentage of load growth or base year sales, or as a fixed number of units of energy savings (e.g., kWh), the latter having the advantage of the actual energy savings being known in advance. Targets can also cover peak electricity demand (e.g., MW capacity). The appropriate EEPS target depends

upon a number of factors including the economically achievable energy efficiency potential, funding availability, emission reduction goals, and other issues including how to treat any existing energy efficiency requirements (e.g., if a robust PBF program or utility program is in place). Key issues to consider include determining how and what analysis to conduct, establishing coverage, deciding the timing and duration of the targets, and addressing funding and related cost recovery issues.

Analysis of Efficiency Potential and Benefits

States have set EEPS based on solid analysis and program experience within the state or in states believed to be comparable. The analysis typically has included a robust study of energy efficiency potential (technically, economically, and practically achievable)⁹, combined with a review of past program experience with energy efficiency measures. California's electricity EEPS are designed to capture 70% of the economic potential for electric energy savings over their 10-year period. California's natural gas EEPS are designed to capture approximately 40% of the maximum achievable potential, in recognition that the need to ramp up efforts may take longer than on the electric side.

In addition to estimating efficiency resource potential, states have estimated other benefits such as expected emission reductions, reduced power prices and total power costs, and net economic benefits such as increased gross state product and increased jobs and wages, using power-sector models and economic impact models (see Chapter 2, *Developing a Clean Energy-Environment Action Plan*, and Section 3.3, *Determining the Air Quality Benefits of Clean Energy*). California's goals were established by considering both per capita energy reduction goals and cost-effectiveness at various reduction levels.

⁹ These are tiers that represent what is first, technically achievable, and of that subset, what is second, economically achievable, and of that subset, finally, what is practically achievable. For more information, see Appendix B, *Energy Efficiency Program Resources*.

Coverage

The coverage of an EEPS depends on the entities under the state's jurisdiction. In the majority of states, state utility commissions typically do not have authority to set requirements for municipal, federally owned, or rural cooperative utilities (although many states do have authority). For this reason, EEPS requirements tend to be assigned to investor-owned utilities. Most EEPS have covered electric utilities alone, although California has set savings goals for both electric and gas utilities.

States have sometimes included provisions to ensure that the energy efficiency measures used (and hence the energy bill savings) are distributed among customer classes (e.g., residential, industrial, commercial) and income levels.

Timing and Duration

Determining the timing and duration of EEPS includes considering the time it can take to achieve energy savings. Generally only a portion of the total energy savings potential can be realized in a given year because of the length of market cycles, limits on funding, and other real-world considerations. Reviewing regulatory compliance deadlines and the achievable efficiency potentials for specific years can help inform these considerations.

Funding

Establishing regulatory mechanisms and/or funding sources for utility or public programs to help achieve the efficiency resource goals is another key issue states have encountered. Different approaches have included one or more of the following: utilizing resources under a state PBF, allowing for cost recovery as part of utility rates, providing direct funding, and establishing regulatory provisions that decouple utility profits from sales volumes (see Section 4.2, *Public Benefits Funds for Energy Efficiency*, and Section 6.2, *Utility Incentives for Demand-Side Resources*).

Program design may or may not involve defining how funds will be raised, spent, and accounted for in

Best Practices: Designing an EEPS

While states have had limited experiences with EEPS as a top-level policy mechanism to date, they have accumulated numerous experiences related to the technologies, programs, and implementation issues related to EEPS goals. In this context, best practices include:

- Obtain top-level commitment to EEPS as a state policy goal, through the legislature, utility commission, or other cognizant bodies.
- Involve key stakeholders early in the development process and provide for continuing stakeholder involvement.
- Use sound analysis, including emissions modeling, economic analysis, and efficiency potential studies, to provide a strong quantitative basis for the EEPS goal.
- Set energy savings goals linked to available, cost-effective potential, based on both quantitative analysis and stakeholder input.
- Use a clear basis for stating goals. Most states specify EEPS goals as a percentage of base-year energy sales or of forecast energy sales growth. Convert EEPS goals to annual energy savings goals and establish methods for converting energy savings to emission reductions.
- Establish an appropriately long time frame to overcome longer market cycles, funding limits and practical considerations, and set annual and cumulative savings goals (e.g., California uses a 10-year time frame with a three-year update cycle).
- Ensure that workable funding methods are available to meet the EEPS goal. The state PUC (or other oversight body) typically performs this task.
- Specify the entities that are responsible for meeting the target and the procurement rules they must follow.

meeting EEPS goals. In California, for example, the PUC requires the utilities to invest in cost-effective energy efficiency as a procurement resource using procurement funds that would otherwise go to purchase power; the utilities also use PBFs and efficiency resource acquisition funds to meet the overall goals.

Interaction with Federal Policies

A variety of federal programs, partnerships, and technical assistance are available to help states achieve their energy efficiency goals. The ENERGY STAR program, for example, offers technical specifications, certification processes, and market development assistance to states and other partners for a range of products and whole-building solutions. (See Section 4.2, *Public Benefits Funds for Energy Efficiency*, for a broader discussion of ENERGY STAR activities.)

As with other energy efficiency measures, to the extent that EEPS produce verifiable capacity savings, they can have favorable reliability and resource adequacy implications reflected in federally jurisdictional wholesale markets overseen by Federal Energy Regulatory Commission (FERC), North American Electric Reliability Council (NERC) and the regional reliability organizations, regional transmission organizations (RTOs), and transmission owning companies.

Interaction with State Policies

EEPS can complement other energy efficiency policies and serve as a framework for a suite of policies and programs. EEPS can be goals for PBF-supported programs or can be additional resource goals beyond savings realized through PBF programs. In addition, some states with EEPS have allowed utilities to recover costs through ratemaking procedures (see Texas example on page 4-13). In some cases, states have pursued decoupling policies to address adverse revenue and profit impacts on investor-owned utilities from EEPS implementation (see Section 6.2, *Utility Incentives for Demand-Side Resources*).

Program Implementation and Evaluation

The implementation of an EEPS occurs primarily through designated utilities and other energy services providers. However, continued state involvement is important in overseeing the development of implementation rules and may be important in ensuring the necessary funding is available. In Texas, for example, where the electric distribution utilities must

meet the EEPS goals, the utility commission is actively involved in determining how resources can be acquired, including defining the means by which covered entities are allowed to comply with goals; defining and implementing reporting requirements; and defining measurement, verification, and other evaluation methods by which compliance will be determined.

Measurement and verification (M&V) is a key aspect in evaluating EEPS. In particular, where EEPS are tied to tradable (energy efficiency) credits, robust measurement and verification is critical to maintaining credibility for the market and commodity. (See the *Approaches to Measurement and Verification [M&V]* box on page 4-10 for more detailed information on the approaches states are using for M&V.)

Oversight

It is also likely that some form of oversight will be needed in the implementation of EEPS. States have decided to establish official oversight or advisory bodies, typically composed of stakeholders who periodically review the EEPS program to determine whether its goals are being met, whether its goals should be renewed or adjusted, and whether other aspects of implementation need modification.

Best Practices: Implementing an EEPS

- Use a clear basis for assessing compliance.
- Update goals on a regular basis (e.g., California uses a three-year cycle) to adjust for changes in economic growth, actual savings, and results of measurement and evaluation studies.
- Ensure additionality (e.g., net new energy savings) by stipulating that savings allowed to qualify for EEPS goals must be over and above any existing program commitments.
- Coordinate EEPS with market transformation programs, PBFs, and other programs to facilitate the market changes that are needed to reach EEPS goals.
- Ensure that electricity and natural gas demand forecasts used in supply-side resource filings reflect the energy savings goals.

Approaches to Measurement and Verification (M&V)

The two principal approaches for measuring and verifying energy efficiency measures are the "deemed savings" approach and the project-specific approach. The deemed savings approach involves estimating energy savings by combining verification that the energy efficiency measure has been installed and can be attributed to the program with the pre-calculated or "deemed" savings from using that measure. This approach can provide an accurate estimate of avoided consumption while minimizing the complexity and cost of M&V by drawing on the extensive field experience from other states. However, it is most appropriate for use with simpler measures whose performance characteristics are consistent in varying applications: a residential lighting retrofit is a typical example.

Deemed savings are calculated by subtracting the energy use of the energy-efficient fixture from the energy use of the baseline fixture. Baseline energy usage and reduced energy usage can be easily calculated based on the deemed savings per fixture, hours of use, and number of installed fixtures. It is also possible to build factors into deemed savings methods to account for persistence of savings, failure rates, free riders, spillover effects, and other issues that can modify total energy impacts. Field evaluation data on many types of efficiency measures are available and can be used to estimate discount factors for a given sample of efficiency measures.

A project-specific M&V method is most widely used for larger and more complex energy efficiency investments. The most well known and referenced M&V document is the International Performance Measurement and Verification Protocol (IPMVP). The IPMVP provides an overview of current best practice techniques available for verifying results of energy efficiency, water efficiency, and renewable energy projects in commercial and industrial facilities. The IPMVP was developed with sponsorship of the U.S. Department of Energy (DOE) and is currently managed by a nonprofit organization that is continually developing new sections for publication as publicly available documents (IPMVP 2005).

Some states use their own project-based M&V system. For example, Texas provides detailed guidance on how to prepare and execute an M&V plan (Texas PUC 2005). California also maintains project-specific M&V resources on its California Measurement Advisory Council (CALMAC) Web site (CALMAC 2005).

Best Practices: Evaluating EEPS Policies

- Design programs under the EEPS policy with evaluation in mind, by building in key tracking and reporting practices that establish baselines for affected markets and technologies and provide the data needed to assess program impacts.
- Draw on other states' experiences to establish rigorous and workable measurement, verification and reporting protocols (e.g., proof of installation, deemed savings, IPMVP). California uses statewide evaluation guidelines for this purpose (see California Public Utilities Commission [CPUC] Web site).
- In addition to quantitative impact evaluation, provide for a qualitative evaluation process that enables program administrators to obtain useful feedback and improve program effectiveness over time.
- Evaluate programs operated under an EEPS policy at appropriate intervals, so that agency overseers can gauge compliance with energy savings goals.
- Utilize an independent, third-party verifier to help build confidence in results. (See text box, *Approaches to Measurement and Verification [M&V]*.)
- Provide for adequate program funding.
- Based on evaluation results, provide feedback to oversight agencies, program administrators, and other participants. Adjust future energy savings goals, as needed.

State Examples

California

California's EEPS emerged from the state's "post-restructuring" resource planning process. Following the state's 2001 electricity problems, the Legislature and the CPUC reviewed the state's overall utility resource planning process and decided to re-engage investor-owned utilities in managing a portfolio of resources to meet customers' needs, including procurement of energy efficiency resources. The CPUC also adopted "decoupling" ratemaking mechanisms that break the link between the utilities' revenues and sales, removing disincentives for utility investments in energy efficiency. (See Section 6.2, *Utility Incentives for Demand-Side Resources*.)

The California EEPS sets ambitious energy savings goals for both electric and gas utilities. Taking direction from the California Energy Action Plan (EAP) and extensive analysis of the economic and achievable potential for energy efficiency, as well as considerations of extensive stakeholder input, the CPUC adopted annual energy savings goals for the state's four largest IOUs. Utility procurement funds are allocated, in addition to California's existing PBF, to achieve these goals and goals for cost-effective efficiency resources. Each IOU acts both as a portfolio manager and program administrator. In doing so, the IOUs assemble their respective portfolios and seek approval for them from the CPUC. The energy efficiency portfolio of programs must meet California's cost-effectiveness tests, and funding source (procurement vs. public benefits) is not a determining factor in approval by the CPUC. The rules that govern all aspects of portfolio management and program administration are found in the CPUC policy manual. The energy savings goals were adopted by the CPUC and established through a collaborative effort with the California Energy Commission (CEC) and with input from key stakeholders (e.g., utilities, environmental groups, and businesses) (CPUC 2004).

Energy efficiency goals are targeted for each year from 2004 to 2013. The cumulative effect of the programs funded from 2004 to 2013 is estimated to result in annual savings in program year 2013 of 23,183 GWh; 4,885 MW of peak demand; and 444 million therms natural gas. These 10-year goals are projected to meet 54% to 59% of the IOUs' electricity sales growth by 2013 and 44% of natural gas sales growth. Program administrators from each IOU are required to submit energy efficiency program plans and funding levels to the PUC.

Also included in the EAP adopted by the CPUC and the CEC, a "loading order" for energy resources was established in which cost-effective energy efficiency and conservation resources are to be selected first, followed by renewable generation. Fossil-fired generation is acquired to meet any remaining resource needs. The EEPS policy and PBF programs were merged, and are largely administered by utilities and implemented by a wide range of both utilities and

non-utilities. Utilities supplement PBFs through utility procurement funding to ensure that the EEPS goals are met. The utilities are required to reduce their demand forecasts to reflect the adopted energy efficiency savings goals and so are further motivated to ensure the reductions are achieved. The utilities' achievements will be subject to rigorous evaluation, measurement, and verification overseen by the CPUC.

Web sites:

<http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/eegoals.htm>

http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm

<http://www.cpuc.ca.gov/PUBLISHED/REPORT/28715.htm>

Illinois

The Illinois Sustainable Energy Plan recommends an energy efficiency portfolio standard that will meet 25% of projected annual load growth by 2015–2017. The Illinois Commerce Commission (equivalent to a state PUC) recently adopted a resolution adopting the proposed plan with some modifications, including moving the start date from 2006 to 2007, to allow for more time to develop market-ready resources and to better align the effort with the timing of related regulatory provisions (the plan itself is voluntary). It has been estimated that the Illinois Sustainable Energy Plan, including the EEPS, will save more than 5,600 GWh, generate more than \$2 billion in investments in Illinois, and create about 2,000 construction jobs and hundreds of permanent jobs (ASE 2005, ICC 2005).

The Illinois EEPS is part of a broader effort that includes an RPS requirement and is intended to gain the combined benefits of reduced demand growth and increased clean generation. This twin approach has broad support from utilities, environmental and consumer groups, and other stakeholders.

Web site:

<http://www.icc.illinois.gov/en/ecenergy.aspx>

Nevada

The Nevada RPS was established as part of the state's 1997 restructuring legislation. In an effort to provide greater flexibility under the RPS, the Nevada legislature adopted Assembly Bill 3 (A.B.3) during a special session in June 2005 to allow electricity providers to meet a portion of their RPS requirements through energy efficiency measures and renewable resources. The bill increases the percentage of energy to come from energy efficiency and renewable sources from 5% (under the original RPS) to 6% from 2005 to 2006 and expands this percentage to 15% from 2011 to 2012 and 20% for 2015 and thereafter. Eligible energy efficiency measures can meet up to 25% of the requirement. Eligible measures include those that are installed on or after January 1, 2005; are located at a retail customer's location; reduce the consumption of energy by the retail customer; and are directly subsidized, in whole or in part, by the electric utility.

In response to this adjustment, two utilities, Nevada Power Company and Sierra Pacific Power Company, have requested approval from the Nevada PUC for additional funding for their 2005 and 2006 demand-side management (DSM) programs. This is the second increase proposed by the utilities since passage of A.B.3. The utilities now plan to spend \$16.2 million on 2005 DSM programs and \$30.5 million in 2006. The 2006 budget will include more than \$2 million for ENERGY STAR appliances and lighting rebates; \$1.9 million for recycling of old, inefficient refrigerators; and \$185,000 for ENERGY STAR New Construction programs.

Web site:
<http://www.newrules.org/electricity/rpsnv.html>

New Jersey

New Jersey's PBF program was initially established by restructuring legislation in 1999. Based on a recent reevaluation of the program's design and administration, New Jersey is adding specific resource goals to its PBF program (NJBP 2004). This is a hybrid approach, in that the overall program is limited by

the public benefits charge levels set in the authorizing legislation and is funded like other public benefits programs. In the past, program administrators were not required to meet specific resource goals—their programs were driven primarily by available funding. Under the new Clean Energy Program model, the New Jersey Office of Clean Energy will use energy efficiency to meet overall energy and demand savings goals within the available funding limits.

In another revision to the New Jersey PBF program, administration and delivery of programs will be solicited competitively (originally, electric utilities provided program administration and ran the programs directly), with the winning bidders agreeing to meet the specific energy savings goals. In this sense, the New Jersey program has added an EEPS component (i.e., the energy savings goals) to a PBF program. However, the EEPS requirement is not imposed directly on utilities, but on whatever entity wins the bid to administer PBF funds.

Web site:
<http://www.bpu.state.nj.us/home/BOCleanEn.shtml>
Click on BPU order EX04040276 (12/23/04).

Pennsylvania

Pennsylvania is pioneering another variation of EEPS. The legislature passed the Alternative Energy Portfolio Standards Act (AEPS) in late 2004. It creates a two-tier set of resource goals for electric utilities. Tier 1 requires 8% of utility energy to come from renewable energy sources (e.g., wind power and solar energy). Tier II calls for a 10% "advanced energy resource" target that can be met by a mix of other types of energy resources, including energy efficiency as well as waste coal generation and hydropower. AEPS represents a new "hybrid" form of EEPS, in that energy efficiency is one of several resources listed in Tier II. In this setting, energy efficiency must compete against the other resource types in Tier II. There is no minimum level of energy efficiency resources that must be acquired (Black & Veatch 2004).

The Pennsylvania AEPS design, in which energy efficiency is included as one of a list of resource options, does not ensure that energy efficiency resources will be acquired. Energy efficiency's contribution to the resource portfolio depends on the availability and relative cost of the resources included in the portfolio. Thus, in theory, if energy efficiency is less expensive than other resource options, it would be acquired in whatever volume is available at the competitive price. However, limited energy efficiency networks, including providers, and other factors may prevent energy efficiency from competing effectively in such a framework. In addition, a lack of mechanisms to decouple utility profits from sales of electricity presents a regulatory disincentive. (See Section 6.2, *Utility Incentives for Demand-Side Resources*.)

While a specific assessment of the energy efficiency aspect of the AEPS has not been conducted, one estimate indicates it could provide cumulative economic benefits of \$2.7 billion in electric savings; 70,000 jobs over 20 years (an average of 3,500 new jobs annually); and \$2.5 billion in additional earnings (Pletka 2004). Another study identifies 16,000 GWh of potential savings from efficiency measures including energy conservation and energy efficiency measures. The AEPS requires that energy conservation measures save energy; thus, direct load control is not included in the potential total for energy conservation (Black & Veatch 2004).

Web site:

http://www.puc.state.pa.us/electric/electric_alt_energy_port_stnds.aspx

Texas

Texas was the first state to adopt energy efficiency goals for utilities as part of its 1999 restructuring law, Senate Bill 7 (S.B.7). This law called for electric distribution utilities to offset 10% of their forecasted load growth through energy efficiency by January 2004. Following enactment, the PUC worked with stakeholders to determine the specific programs

through which this target would be reached.

Program templates included the following "standard offer"¹⁰ and "market transformation"¹¹ measures:

- *Standard Offer.* Commercial and industrial customers, residential and small commercial customers, load management projects, and hard-to-reach customer (customers with an annual household income at or below 200% of the federal poverty guidelines).
- *Market Transformation.* ENERGY STAR homes, residential ENERGY STAR windows, air conditioner distributor, and air conditioner installation information and training.

These programs were funded through a bill charge included in each utility's transmission and distribution rates, collecting about \$80 million for annual efficiency program expenditures. Utilities were thus able to recover costs associated with the program, including incentive payments and program administration (capped at 10% of total).

Evaluations indicate that the goal of offsetting 10% of load growth is being exceeded. Load growth has averaged about 2% per year; 10% of this level of growth amounts to about 0.2% of total annual sales (Gross 2005a). Leading state efficiency programs are showing impacts as high as 1% of total annual sales. Projected results include 7,300 tons in nitrogen oxide (NO_x) reductions over 10 years, which Texas estimates is equivalent to removing 140,000 motor vehicles from the roadway, and energy savings valued at \$25 million per year.

In addition to the statewide EEPS directed specifically at utilities, Texas broadened its efforts to encompass local governments, in part because Texas contains two severe nonattainment areas for ground-level ozone and sees energy efficiency as an important, cost-effective element of its air quality strategy. In 2001, Texas set energy efficiency goals for local government through Senate Bill 5 (S.B.5)—known as the Texas Emissions Reduction Plan.

¹⁰ Refers to programs where a utility administers a contract with an energy service provider that specifies a standard payment based on the amount of energy saved through the installation of energy efficiency measures.

¹¹ Refers to strategic efforts, including incentives and education, to reduce market barriers for energy efficiency.

S.B.5 requires 38 local governments to reduce electricity consumption by 5% a year for five years and report annually to the State Energy Conservation Office (SECO). The Texas PUC and SECO are working with local governments and utilities to implement efficiency improvement programs and projects, measure and verify energy savings, and incorporate emission reductions into local air quality plans. The Dallas-Fort Worth nonattainment area is including efforts under S.B.5 in its State Implementation Plan (SIP) for ozone attainment. (See Section 3.3, *Determining the Air Quality Benefits of Clean Energy*.)

Web sites:

1999 Texas Electricity Restructuring Act:

<http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=76&SESS=R&CHAMBER=S&BILLTYPE=B&BILLSUFFIX=00007>

S.B.7:

<http://www.centerpointefficiency.com/about/>
<http://www.mcombs.utexas.edu/research/bbr/bbrpub/tbr/pdf/Aug.99.zar.pdf>

S.B.5:

<http://www.seco.cpa.state.tx.us/sb5report2004.pdf>
<http://www.texasenergypartnership.org/>

What States Can Do

States with either restructured or traditional utility markets have set EEPS goals for utilities. These goals can be administered in association with PBFs or regulated utility efficiency programs. Because the EEPS approach can support multiple purposes, including Clean Air Act compliance plans, utility-sector resource plans, and climate action plans, states can set EEPS goals within the context of broad energy and environmental policy goals.

Action Steps for States

The key steps to establishing EEPS are:

- Conduct background analysis, including assessing historical experience and results from past energy efficiency programs and conducting a robust analysis of energy efficiency potential, an economic assessment of potential benefits and costs, and a determination of the range of savings targets that would be realistic for an EEPS.
- Design and develop the EEPS program by determining the appropriate goals, the sectors covered by the goals, the kinds of resources that can be acquired, and the time frame.
- Define an implementation process that sets rules and procedures for how resources can be acquired in the program, M&V requirements, evaluation procedures, and general oversight.
- Provide for periodic evaluation and program review at specified intervals.

Information Resources

Information About States

Title/Description	URL Address
California Action Plan. This Web site contains the text of the California EAP. CEC and CPUC. 2003. California EAP, May 8, 2003. CEC and CPUC.	http://www.energy.ca.gov/energy_action_plan
California Integrated Energy Policy Report. This CEC report lays out policy recommendations for electricity, natural gas, transportation, and the environment. CEC. 2003. California Integrated Energy Policy Report, December. CEC.	http://www.energy.ca.gov/reports/100-03-019F.pdf
CPUC Energy Efficiency Goals Web site. This Web site contains information on energy efficiency potential, including KEMA-Xenergy efficiency potential studies and the Hewlett Foundation "Secret Energy Surplus" report. CPUC. 2005. Evaluation, M&V. CPUC.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/eegoals.htm
Illinois Sustainable Energy Plan. This Web site contains the Illinois Sustainable Energy Plan, as submitted to the Illinois Commerce Commission on February 11, 2005.	http://www.icc.illinois.gov/en/ecenergy.aspx
Midwest Energy Efficiency Alliance (MEEA) Comments to Illinois Commerce Commission on the Illinois Sustainable Energy Plan. MEAA is a collaborative network whose purpose is to advance energy efficiency in the Midwest in order to support sustainable economic development and environmental preservation. It is a leader in raising and sustaining the level of energy efficiency in the Midwest region.	http://www.icc.state.il.us/ec/docs/050309ecCommentsMidwest1.pdf
The Pennsylvania PUC AEPS Web site, 2005. This Web site contains information on legislation, technical conferences, work groups, and general information about alternative energy sources.	http://www.puc.state.pa.us/electric/electric_alt_energy_port_stnds.aspx
Promoting Energy Efficiency in California. State EE/RE Technical Forum, May 18, 2005. Presentation by Brian C. Prusnek, Advisor to Commissioner Susan P. Kennedy, CPUC.	http://www.epa.gov/cleanenergy/pdf/keystone/PrusnekPresentation.pdf

Information About Measurement and Verification

Title/Description	URL Address
Applications Team: Energy-Efficient Design Applications. This Web site provides numerous resources, ranging from implementation guidelines to checklists and other resources, to help organizations implement an M&V program.	http://ateam.lbl.gov/mv/
ASHRAE Guideline 14-2002. Measurement of Energy and Demand Savings. ASHRAE, June 2002. This document provides guidelines for reliably measuring energy and demand savings of commercial equipment.	http://resourcecenter.ashrae.org/store/ashrae/newstore.cgi?categoryid=310&categoryparent=156&loginid=6294016 Click on the link to Guideline 14-2002—Measurement of Energy and Demand Savings.
Section III Measurement and Verification Guidelines. This document provides general guidelines for preparing an M&V plan, choosing an M&V option and method, defining and adjusting baselines, and collecting and submitting M&V data.	http://search.pge.com/cs.html?url=http%3A/www.pge.com/docs/pdfs/biz/rebates/spc_contracts/2000_on_peak_incentive/III-m%26v.pdf&qt=M%26V&col=pge&n=1
CALMAC Web site. California's statewide CALMAC evaluation clearinghouse contains resources for deemed savings and project-specific M&V techniques.	http://www.calmac.org

Title/Description	URL Address
Efficiency Vermont Technical Reference User Manual. Vermont provides a set of deemed-savings methods in this manual.	TRM 4-19, published by Efficiency Vermont 255 S. Champlain Street, Burlington, VT 05401-4717, phone 888-921-5990.
Electric and Gas Conservation Improvement Program Biennial Plan for 2005 and 2006. This plan was submitted to the Minnesota Department of Commerce by Xcel Energy, June 1, 2004. Docket No. E, G002/CIP-04.	URL not available.
EPA report: Creating an Energy Efficiency and Renewable Energy Set-Aside in the NO_x Budget Trading Program: Measuring and Verifying Electricity Savings. This forthcoming EPA report describes key M&V resources.	Contact EPA.
Evaluation, Measurement and Verification Workshop. The CPUC held several workshops on evaluation, measurement, and verification. The primary purpose of these workshops was to discuss the performance basis, metrics, and protocols for evaluating and measuring energy efficiency programs, including incentive, training, education, marketing, and outreach programs.	http://www.fypower.org/feature/workshops/workshop_5.html The final Decision can be found at: http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/45783.htm
IPMVP Web Site. IPMVP Inc. is a nonprofit organization that develops products and services to aid in the M&V of energy and water savings resulting from energy/water efficiency projects—both retrofits and new construction. The site contains the IPMVP, a series of documents for use in developing an M&V strategy, monitoring indoor environmental quality, and quantifying emission reductions.	http://www.ipmvp.org
New York State Energy Research and Development Authority (NYSERDA) Standard Performance Contracting Program Measurement and Verification Guideline. M&V guidelines are included in NYSEDA's request for applications for performance contracting.	http://www.nyserda.org/funding/855PON.html http://www.nyserda.org/wms/docs_funding/909PON.pdf
Northwest Power Planning Council: 5th Power Plan. 2005–2009 Targeted Conservation Measures and Economics.	http://www.nwppc.org/energy/powerplan/draftplan/Default.htm
Oncor Commercial & Industrial Standard Offer Program 2003. Measurement and Verification Guidelines. (Includes retrofit and new construction and default savings values for lighting, motors, and air-conditioning equipment.)	http://www.oncorgroup.com/electricity/teem/candi/default.asp
PA Knowledge Limited 2003: Standardized Methods for Free-Ridership and Spillover Evaluation—Task 5 Final Report. June 16, 2003 (sponsored by National Grid, NSTAR Electric, Northeast Utilities, Unitil and Cape Light Compact). This report is used by Massachusetts utilities to estimate free ridership and spillover effects.	Contact PA Consulting at: http://www.paconsulting.com
Southern California Edison (SCE), December 04 Program Summary Reports.	http://www.sce.com/AboutSCE/Regulatory/eefilings/MonthlyReports.htm

Examples of Legislation/Regulation

State	Title/Description	URL Address
California	California Interim Opinion: Administrative Structure for Energy Efficiency (Decision 05-01-055). This CPUC rule sets the administrative structure and process for energy efficiency programs.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/43628.htm
	California Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond (Decision 04-09-060). This CPUC rule sets energy efficiency goals for the state.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm

State	Title/Description	URL Address
California (cont.)	California Ruling: Instructions for Filing Proposals on Energy Efficiency Administrative Structure. This CPUC ruling sets the requirements and process for proposals recommending an energy efficiency administration structure. The ruling includes helpful background documents, including an overview of energy efficiency administration structures in place in other states and a framework for administrative roles and responsibilities.	http://www.cpuc.ca.gov/PUBLISHED/RULINGS/35120.htm
Connecticut	Energy Independence Act. This act establishes a Distributed RPS that includes energy efficiency from commercial and industrial facilities, and combined heat and power and commercial and industrial load management programs.	http://www.cga.ct.gov/2005/TOB/h/pdf/2005HB-07501-R00-HB.pdf
Hawaii	Hawaii's Renewable Portfolio Standard Act. This act requires electric utilities to meet an RPS of 15% in 2015 and 20% in 2020.	http://www.hawaii.gov/dbedt/ert/rps.html
Illinois	Illinois Sustainable Energy Plan. This Web site contains the Illinois Sustainable Energy Plan, as submitted to the Illinois Commerce Commission on February 11, 2004.	http://www.renewableenergyaccess.com/assets/download/IllinoisGov_RPS.pdf
Nevada	Nevada A.B.3. This bill redefines the portfolio standard to include energy efficiency and renewable energy.	http://www.leg.state.nv.us/22ndSpecial/Reports/history.cfm?ID=2546 http://leg.state.nv.us/22ndSpecial/bills/AB/AB3_EN.pdf
New Jersey	Clean Energy Board Order—In The Matter of the New Jersey Clean Energy Program Policies and Procedures (12/09/04).	http://www.bpu.state.nj.us/wwwroot/cleanEnergy/E002120955_20041209.pdf
	The State of New Jersey Board of Public Utilities (NJBPU) rule. This rule establishes PBF goals, December 22, 2004. Docket No. EX0404276.	http://www.bpu.state.nj.us/home/BOCleanEn.shtml Click on BPU order EX04040276 (12/23/04).
Pennsylvania	Pennsylvania Alternative Energy Legislation. This Web site contains the text of Pennsylvania's Alternative Energy Portfolio Standards Act of 2004 (Senate Bill 1030).	http://www.legis.state.pa.us/WU01/LI/BI/BT/2003/0/SB1030P1973.HTM
Texas	The Center for Energy Efficiency and Renewable Technologies. Texas Cleans Up Its Act, article reprinted from the Clean Power Journal. This article details the passage and key provisions of Texas S.B.7, which encourages the development of renewable energy.	http://www.ceert.org/pubs/cpjjournal/99/summer/texas.html
	Emission Reduction Incentive Grants Reports. Prepared for the Texas Natural Resource Conservation Commission for a Joint Report to the 78th Legislature. In this report the Texas PUC has quantified the results of legislated energy efficiency programs designed to reduce electric power production and air emissions.	http://www.tnrc.state.tx.us/oprd/sips/PUC_report.pdf
	PUCOT Rules for Texas Electric Restructuring Act § 25.181. The Texas PUC rules set out implementation strategies for utilities and local governments energy efficiency programs.	http://www.puc.state.tx.us/rules/subrules/electric/25.181/25.181.doc
	Texas S.B.5 and S.B.7. These laws establish energy savings goals for utilities and local government. S.B.7 is the Texas Electric Restructuring Act of 1999, Legislative Session 76.	http://www.puc.state.tx.us/electric/projects/20970/20970arc/sb7rules.doc See also: http://www.capitol.state.tx.us/cgi-bin/db2www/tlo/billhist/billhist.d2w/report?LEG=76&SESS=R&CHAMBER=S&BILLTYPE=B&BILLSUFFIX=00007

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CPUC. 2004. Order Instituting Rulemaking to Examine the Commission's Future Energy Efficiency Projects, Administration and Programs, September 23, 2004, Decision 04-09-060, Rulemaking 01-08-028 Interim Opinion: Energy Savings Goals for Program Year 2006 and Beyond. CPUC.	http://www.cpuc.ca.gov/PUBLISHED/FINAL_DECISION/40212.htm
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IPMVP. 2005. Efficiency Valuation Organization. IPMVP Web site.	http://www.ipmvp.org
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NJBPU. 2004. Clean Energy Board Order—In The Matter of the New Jersey Clean Energy Program (NJCEP) Policies and Procedures. December 1.	http://www.bpu.state.nj.us/wwwroot/cleanEnergy/E002120955_20041209.pdf
Pletka, R. 2004. Potential Impacts of An Advanced Energy Portfolio Standard in Pennsylvania. Presentation for the National Renewable Energy Laboratory (NREL) Energy Analysis Forum, Black & Veatch. November 9.	http://205.168.79.26/analysis/forum/presentations_04.html
Public Utility Commission of Texas. 2005. M&V Guidelines. Energy Efficiency Implementation. Austin, TX.	http://www.puc.state.tx.us/electric/projects/30331/052505/m%26v%5Fguide%5F052505.pdf

4.2 Public Benefits Funds for Energy Efficiency

Policy Description and Objective

Summary

Many states are finding PBFs to be an effective mechanism for securing investment in cost-effective energy efficiency, resulting in lower cost and cleaner energy. PBFs in 17 states and Washington, D.C. provide nearly \$1 billion annually for energy efficiency and related programs. States with restructured as well as traditional electricity markets are using PBFs as a component of their clean energy policy portfolios.

PBFs, also known as system benefits charges (SBCs) or clean energy funds, are typically created by levying a small charge on every customer's electricity bill. These funds provide an annual revenue stream to fund energy efficiency programs. The charges range from 0.03 to 3 mills¹² per kilowatt-hour (kWh) and are equivalent to about \$0.27 to \$2.50 on a residential customer's monthly energy bill (ACEEE 2004b). Where there are comprehensive, statewide programs in place, funding levels range from about 1 to 3% of total utility revenues.

PBFs were originally developed during the 1990s to help fund public benefit programs for energy efficiency, clean energy supply, and low-income electricity bill assistance. Utilities had become hesitant to invest in clean energy activities, anticipating restructuring of electricity markets that would shift incentives and alter requirements. In many cases, states that restructured their electricity markets instituted PBFs to address the critical needs exposed by this decline in utility investments. Despite the creation of PBFs, funding for energy efficiency and diversified energy supply in many states is still below the funding levels of the early 1990s, but has increased overall in recent years (ACEEE 2004b, ACEEE 2004c, ACEEE 2005a).

A well-designed and administered public benefits fund (PBF) increases public and private sector investments in cost-effective energy efficiency, resulting in reduced energy costs for electricity customers, emission reductions, and enhanced reliability.

Total ratepayer-funded electric energy efficiency program spending (including PBF programs and other programs funded via customer bills) reached \$1.35 billion in 2003. In nominal dollars, this was the highest level spent on electric energy efficiency programs since 1996 (ACEEE 2005a). However, in real dollars, the level of funding in nearly every state is still below the levels of the early 1990s.

States are finding that PBFs provide significant reductions in electricity demand and related emissions at a relatively low cost. For just 12 of the states with energy efficiency PBFs, total annual investments of about \$870 million in 2002/2003 yielded nearly 2.8 million MWh of electricity savings. Emission reductions from nine of these states included a total of 1.8 million tons of carbon dioxide (CO₂). The median program cost was \$0.03 per kWh saved, which is one-half to three-quarters of the typical cost of new power sources and less than one-half of the average retail price of electricity (ACEEE 2004a, ACEEE 2004b, EIA 2005).

Seventeen states and Washington, D.C. have adopted PBFs that provide nearly \$1 billion in support annually for energy efficiency and have yielded over 2.8 million MWh in annual electricity savings (ACEEE 2004b).

Objective

The objectives of PBF programs for energy efficiency include:

- Saving energy and avoiding new generation through long-lasting improvements in energy efficiency.

¹² 1 mill = one-tenth of a cent.

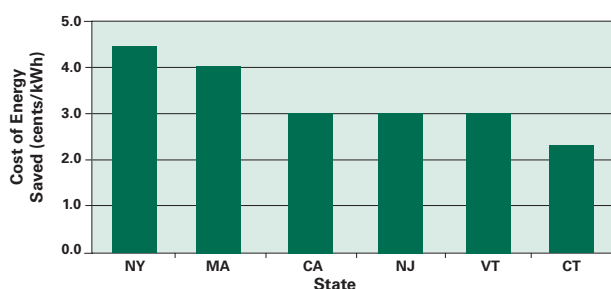
- Lowering energy demand and reducing air pollutant and greenhouse gas emissions.
- Reducing customers' energy costs.

Most states also use their PBFs to support development of clean energy supplies, such as renewable energy and combined heat and power (CHP), provide assistance to low-income consumers, support consumer education, and support research and development of new clean energy technologies (see Chapter 5, *Energy Supply Actions*).

Benefits

Well-designed and administered PBFs have been shown to reduce energy demand at a lower cost (see Figure 4.2.1) than new supply and deliver a variety of benefits. They reduce energy costs for utility customers by reducing average bills and by limiting future energy price increases. They also improve the reliability of the electricity grid and reduce emissions. Some states use PBF dollars to support research and development related to clean energy technologies and processes.

Figure 4.2.1: Cost of Energy Saved (cents/kWh) for Six State Public Benefits Funds



Source: ACEEE 2004b.

Funding levels for comprehensive programs generally range from 1 to 3% of total utility revenues. On average, each percent of revenues invested yields about 5% in cumulative energy savings over five years and 10% over 10 years (ACEEE 2004b). While the percent of revenues spent is not the only factor

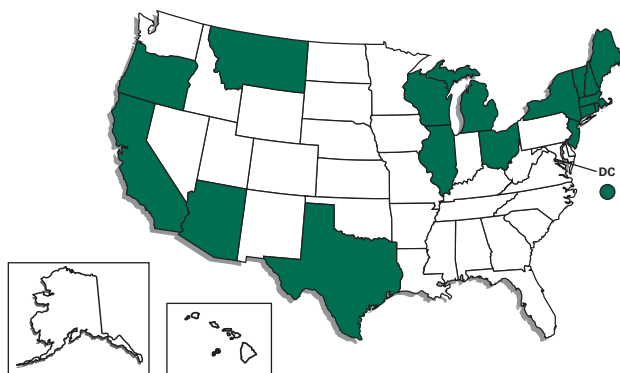
affecting the impact of efficiency programs, it provides an indication of the magnitude of savings that states can expect.

PBFs have also been shown to help create jobs by lowering energy costs and stimulating new public and private sector investments. Recent analyses of the New York Energy \$mart Program show that the program creates and sustains 4,700 jobs, increases labor income by \$182 million per year, and increases economic output by \$224 million per year (NYSERDA 2004a).

States with Energy Efficiency PBFs

Seventeen states and Washington, D.C. (shown in Figure 4.2.2) have established PBFs to support energy efficiency at various levels of funding. Eleven of the states have programs that are actively promoting energy efficiency, making investments at or above the median level of about 1 mill/kWh.

Figure 4.2.2: States with PBFs for Energy Efficiency



Sources: ACEEE 2004b, ACEEE 2004c.

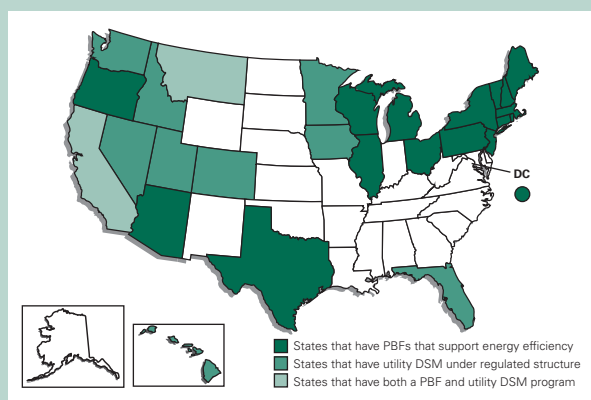
Notes: Nevada's program, originally introduced under a now-repealed electricity restructuring process, is not technically a PBF. As of 2003, energy efficiency funding is approved as part of utility IRP (ACEEE 2004b).

Texas's program is tied to the state's utility energy efficiency savings targets and costs are covered through a non-bypassable charge in transmission and distribution rates. (See Section 4.1, *Energy Efficiency Portfolio Standards*.) The utilities submit rate filings to the utility commission to cover estimated costs (ACEEE 2004b).

Figure 4.2.3: Ratepayer-Funded Energy Efficiency Programs

PBFs are the most prevalent mechanism for supporting ratepayer-funded energy efficiency programs. States also support energy efficiency through utility demand-side management,^a including the approval of tariff riders or the inclusion of energy efficiency program costs in the rates supervised by the public utility commission (PUC) or equivalent regulatory body. Some states, such as California and Montana, undertake a combination of these approaches. Most of the PBFs for energy efficiency were created as part of a state's electricity market restructuring process. Some states (e.g., California and Nevada) have repealed the restructuring process, at least in part, leading to a hybrid or modified approach to funding energy efficiency. Public benefit funds were also created in states that did not restructure, including Wisconsin and Vermont. (See also *Interaction with State Policies, Utility Policies*, on page 4-27.)

The following map illustrates the different funding arrangements that states are using to support energy efficiency.^{b, c}



- ^a Utility DSM programs included in the map are for states where energy efficiency spending as a percentage of revenues is greater than 0.25% (ACEEE 2005a).
- ^b Nevada's program, originally introduced under a now-repealed electricity restructuring process, is not technically a PBF; as of 2003, the energy efficiency funding is approved as part of utility Integrated Resource Planning (IRP) (ACEEE 2004b).
- ^c Texas's program, created as part of a restructuring process, is tied to the state's utility energy efficiency savings targets and costs are covered through a non-bypassable charge in transmission and distribution rates. (See Section 4.1, *Energy Efficiency Portfolio Standards*.) The utilities submit rate filings to the PUC to cover estimated costs (ACEEE 2004b).

Sources: ACEEE 2004b, ACEEE 2004c, ACEEE 2005a, ACEEE 2005b.

Most of the states have implemented electricity restructuring. However, restructuring is not a prerequisite for establishing a PBF. Some states, including Wisconsin, Vermont, and Oregon, have kept retail markets largely regulated and have also created PBFs to provide the public benefits described above. California has rescinded its restructuring process but continues to use PBFs. In some states, moving to a PBF model from traditional regulated efficiency programs reflects the changing roles of utilities in retail markets, while delivering the benefits of efficiency through other channels. This mixture of approaches to ratepayer-funded energy efficiency programs is described in Figure 4.2.3.

Designing an Effective PBF Program

This section identifies several key issues that states consider when designing an effective PBF. These issues include identifying key participants and their roles; determining appropriate funding levels; and determining the appropriate duration of a PBF, what portfolio of activities to choose, and interaction with other state and federal policies.

Participants

- **State Legislatures.** In most states, the state legislature authorizes and periodically reviews PBFs program implementation status, funding levels, and results. They enact legislation to set up the PBF, identify goals and objectives, determine the charge, specify implementing and oversight organizations, and review program authorization at specified intervals.
- **Ratepayers.** PBFs are funded by ratepayers, typically through a "non-bypassable" charge on distribution services, so that all customers pay irrespective of the supplier. A handful of states (i.e., Montana, Oregon, Vermont) have included limited provisions for large industrial customers to obtain a credit or refund based on documented spending on efficiency (ACEEE 2004b).
- **Utilities.** Utilities play a role in processing the charges, potentially administering the fund, and in many cases implementing energy efficiency

measures. They also are important sources of data for reporting results.

- *PUCs and Third-Parties.* Depending on the state, PUCs or nonprofit organizations may also play a role by administering and/or evaluating the PBFs.
- *Public and Private Sector Organizations.* State PBF investments also leverage additional public and private sector energy and efficiency investment. Studies indicate that each \$1 spent from the fund leverages roughly \$3 in related business and consumer investment (ACEEE 2004c).

Funding

- *Mechanism.* Most states apply a system-wide charge (usually in mills/kWh) that applies to all electricity customers. Some states have developed alternative funding structures, including flat monthly fees, utility-financed programs, and performance goals. The mills/kWh mechanism is the most common, the simplest, and the most transparent.

- *Funding Level.* The funding level for energy efficiency-related programs ranges between 0.033 and 3 mills/kWh in the most active states (ACEEE 2004b). Table 4.2.1 shows the funding level by state, and total annual funding for energy efficiency for the 11 most active states (those whose spending is at or above the median of about 1 mill/kWh).
- *Allocation of PBF Resources.* The degree to which the program administrator will be able to reallocate program dollars within the portfolio once it has been approved by the PUC or other oversight authority has been an important issue for states. This flexibility has proven important because field experience often indicates needs to adjust the program portfolio in terms of design, funds allocation, or both. If an administrator has to obtain approval for any change in use of funds, program operations could be delayed, or could result in reduced impacts or eroded cost-effectiveness. For instance, California has provided utilities with more flexibility in recent administrative rulings.

Table 4.2.1: Comparison of 11 State PBFs for Energy Efficiency

(sorted by charge level at 1 mill/kWh and greater)

	CT	VT	MA	RI	NH	ME	CA	NJ	OR	WI	NY
Administrative mechanism											
State			●			●	●	●		●	●
Utility	●		●	●	●		●				
Third-party		●							●		
Funding level (mills/kWh)	3.00	2.90	2.50	2.30	1.80	1.50	1.30	1.30	1.26	1.15	1.02
Annual funding for energy efficiency (\$ millions)	\$87	\$17	\$117	\$15	\$15	\$15	\$280	\$89	\$40	\$62	\$87
% of revenue to energy efficiency programs	3.0	3.4	2.5	2.3	1.52	1.3	2.3	1.35	2.0	2.3	0.75
Total funding—all programs (\$ millions)	\$118	\$17	\$141	\$15	\$25	\$21	\$580 (includes procurement)	\$129	\$70	\$115	\$150

Key: ● = primary fund administrator.

Sources: ACEEE 2004c, CEC 2005.

- *Administration and Cost Recovery.* A PBF essentially serves as a means for cost recovery in place of the traditional rate case that utilities undergo for a demand-side management (DSM) program. There are two basic approaches for administering the funding collected under a PBF, both of which can affect how costs are recovered. Under the first and most common approach, money is collected and spent during the current year, in an expenses-based mode. If there is an under- or over-collection, it floats in an account, and is adjusted in the following year. This account may be controlled by a utility or a third-party administrator, depending upon the type of administering body. (See also *Administering Body* on page 4-28.) The second approach is to use the money collected in the PBF to capitalize a revolving fund for grants and loans, which is replenished or expanded with new PBF collections.

Timing and Duration

Some states leave the duration of the fund open-ended, while others stipulate operational periods ranging from three to 10 years. None of the states have discontinued their PBFs, even when the initial implementation period ended.

In the past, it was not uncommon to have short, even annual, program approval cycles. This short cycle took substantial time and resources away from program delivery, and created uncertainty in customer markets. More recently, the trend is toward multi-year approval cycles. Many states have found that longer cycles reduce administrative costs and allow programs to operate more effectively in the market.

PBFs are sometimes redirected to meet other state needs during the budget process in lean years. While there is no foolproof method to avoid funding being shifted to other purposes, some states have used legislative language to avoid it. For example:

- *Vermont.* "Funds collected through an energy efficiency charge shall not be funds of the state, shall not be available to meet the general obligations of the government, and shall not be included in the financial reports of the state" (State of Vermont 1999a).
- *Washington, D.C.* "All proceeds collected by the electric company...shall not at any time be transferred to, lapse into, or be commingled with the General Fund of D.C. or any account of D.C." (Washington, D.C. 2004).

One way states are keeping PBFs targeted to energy efficiency is to use statistical information to educate stakeholders about the energy, economic, and environmental benefits of the PBF. Ensuring adequate, consistent, and stable funding is critical for the success of the program and to ensure the continuing participation of the private sector.

Developing a Portfolio of Activities

Targeting Efficiency Investments

States use PBFs to support a variety of program approaches to increasing the use of energy-efficient products and technologies and reducing energy consumption. Approaches include rebate (or "buy-down") programs for energy-efficient appliances and equipment, programs that offer technical assistance and financial incentives to encourage investment in energy-efficient technologies and assist with installation, and efforts at market transformation including disseminating information to increase consumer energy awareness and permanently change energy-related decisionmaking. (See Section 3.4, *Funding and Incentives*, for more detail on some of these options.)

States may also use PBFs to support load management programs that encourage reductions in energy use and shifts from on-peak to off-peak periods, to address concerns with prices and system reliability, but such shifts may not be accompanied by net reductions in energy use (NYSERDA 2005).

States use several criteria for choosing which energy efficiency measures are supported by their PBF program. They include the following:

- Customer classes served by the measure.
- Distribution of benefits across customer classes and service territories.

- Cost-effectiveness of individual measures and the overall program portfolio.
- Other social and environmental benefits (e.g., serving low-income customers, reducing criteria pollutants, and managing load and improving reliability of the electricity grid).

Factors such as whether an efficiency measure also delivers energy reductions at peak times, reduces water consumption, or offers other nonenergy benefits are also taken into consideration. Many efficiency PBFs also invest a portion of their funding in research and development programs to identify and verify the performance of emerging technologies, practices, or innovative program models.

PBF programs seek to benefit all customers and customer classes. However, resource limitations typically result in programs targeting the most cost-effective opportunities for energy savings. States served by multiple utilities may also need to ensure that customers in each utility's service territory receive direct benefits, proportional to the amount their customers have paid into the system.

In addition to benefit-cost analysis, PBF administrators also use other criteria to guide program design and investments, such as customer equity and serving hard-to-reach customer markets. The least expensive energy savings are often found in large commercial and industrial customers. However, for customer equity reasons, most PBF program portfolios seek to reach a range of customer groups, including low-income, small business, and other submarkets where lowering energy costs is especially important.

In addition to needing to serve multiple customer classes, some of which are harder or more expensive to reach, program administrators typically balance their efficiency programs based on the same principles that one would use in evaluating a stock portfolio.

- How reliable is the investment?
- When will it achieve savings?
- How long will those savings last?

- What other investments/strategies need to be considered to offset risk?
- Is it wise to include some long-term investments?

Some states target a portion of their efficiency investments to heavily populated areas or business districts to help alleviate transmission congestion and offset or postpone transmission infrastructure investments. For example, Connecticut's Conservation and Load Management Fund targets funding to address transmission congestion problems in southwest Connecticut. By linking actions to load management programs, states can use PBFs to help prevent brownouts and ensure reliable energy supply, which benefits all electricity customers.

Determining Cost-Effectiveness

Many states incorporate cost-effectiveness analysis into the design and evaluation of their programs. This helps ensure the effective use of public funds and can be used to compare program and technology performance with the aim of developing effective future programs. Cost-effectiveness tests commonly used by states are shown in Table 4.2.2. Many states use a Total Resource Cost (TRC) Test as the basic economic assessment tool. The TRC Test assesses the net lifetime benefits and costs of a measure or program, accounting for both the utility and program participant perspectives. As with other cost-effectiveness tests, if the benefit-cost ratio is greater than one, it is deemed to be cost-effective. If applied at a portfolio level, individual measures and programs can then be further screened based on the extent to which benefits exceed costs and on other portfolio considerations mentioned previously.

Sometimes states use a combination of tests to examine the program impacts from different perspectives. States wishing to consider the non-electric implications for energy use and energy savings may use the Societal Test, which incorporates a broader set of factors than the TRC Test. The Program Administrator and Participant Tests are sometimes used to help design programs and incentive levels, rather than as a primary screen for overall cost-effectiveness.

Table 4.2.2: Common Cost-Effectiveness Tests

Type of Test	Description
Total Resource Cost Test	Compares the total costs and benefits of a program, including costs and benefits to the utility and the participant and the avoided costs of energy supply.
Societal Test	Similar to the TRC Test, but includes the effects of other societal benefits and costs such as environmental impacts, water savings, and national security.
Program Administrator Test	Assesses benefits and costs from the program administrator's perspective (e.g., benefits of avoided fuel and operating and capacity costs compared to rebates and administrative costs).
Participant Test	Assesses benefits and costs from a participant's perspective (e.g., reductions in customers' bills, incentives paid by the utility, and tax credits received as compared to out-of-pocket expenses such as costs of equipment purchase, operation, and maintenance).
Rate Impact Measure	Assesses the effect of changes in revenues and operating costs caused by a program on customers' bills or rates.

Source: UNEP 1997.

If using only one test, states are moving away from the Rate Impact Measure (RIM) test because it does not account for the interactive effect of reduced energy demand from efficiency investments on longer-term rates and customer bills. Under the RIM test, any program that increases rates would not pass, even if total bills to customers are reduced. In fact, there are instances where measures that increase energy use pass the RIM test.

While many utilities and PUCs express program performance in terms of benefit-cost ratios, expressing program costs and benefits in terms of \$/kWh is also useful because it is easy to relate to the cost of energy. Consumers and legislators can easily relate this metric to the cost of energy in their own area, while utilities and regulators can compare this value to the cost of other resources, such as new generation. When expressed this way, the annual levelized TRC in \$/kWh captures the net program and customer costs

divided by the projected lifetime savings of the measure or program. Resource costs can also be calculated in \$/kW to illustrate the value during periods of peak demand. (See also Section 6.1, *Portfolio Management Strategies*.)

Interaction with Federal Policies

Several federal programs can help support the programs administered through PBFs.

The ENERGY STAR Program

ENERGY STAR is a voluntary, public-private partnership designed to reduce energy use and related greenhouse gas emissions. The program, administered jointly by the U.S. Environmental Protection Agency (EPA) and the U.S. Department of Energy (DOE), has an extensive network of partners including equipment manufacturers, retailers, builders, energy service companies, private businesses, and public sector organizations.

Since the late 1990s, EPA and DOE have worked with utilities, state energy offices, and regional nonprofit organizations to help them leverage ENERGY STAR messaging, tools, and strategies and enhance their local energy efficiency programs. Today more than 350 utilities and other efficiency program sponsors, servicing 60% of U.S. households, participate in the ENERGY STAR program.

EPA and DOE invest in a portfolio of energy efficiency efforts that state and utility run energy efficiency programs can leverage to further their PBF programs, including:

- *Education and Awareness Building.* ENERGY STAR sponsors broad-based public campaigns to educate consumers on the link between energy use and air emissions and to raise awareness about how products and services carrying the ENERGY STAR label can protect the environment while saving money.
- *Establishing Performance Specifications and Performing Outreach on Efficient Products.* More than 40 product categories include ENERGY STAR-qualifying models, which ENERGY STAR promotes through education campaigns, information

exchanges on utility-retailer program models, and extensive online resources. Online resources include qualifying product lists, a store locator, and information on product features.

- *Establishing Energy Efficiency Delivery Models to Existing Homes.* ENERGY STAR assistance includes an emphasis on home diagnostics and evaluation, improvements by trained technicians/building professionals, and sales training. It features online consumer tools including the Home Energy Yardstick and Home Energy Advisor.
- *Establishing Performance Specifications and Performing Outreach for New Homes.* ENERGY STAR offers builder recruitment materials, sales toolkits and consumer education, and outreach that helps support builder training, consumer education, and verification of home performance.
- *Improving the Performance of New and Existing Commercial Buildings.* EPA has designed an Energy Performance Rating System to measure the energy performance at the whole-building level, to help go beyond a component-by-component approach that misses impacts of design, sizing, installation, controls, operation, and maintenance. EPA uses this tool and other guidance to help building owners and utility programs maximize energy savings.

The State Energy Program

DOE offers a range of financial and technical assistance programs that support state efficiency programs. The State Energy Program administered by DOE offers grants to states to implement energy programs. State energy offices can leverage PBFs by coordinating activities with state energy programs. DOE's Weatherization Assistance Program (WAP) enables low-income families to permanently reduce their energy bills by making their homes more energy efficient.

Interaction with State Policies

PBFs can be used to leverage existing state-administered programs, such as traditional utility-based energy efficiency programs, and support other state policies, such as building codes.

Best Practices: Developing and Adopting a PBF Policy

The best practices identified below will help states develop effective PBF programs. These best practices are based on the experiences of states that have highly effective PBFs for energy efficiency.

- Determine the cost-effective, achievable potential for energy efficiency in the state.
- Start with low-cost, well-established programs and efficiency investments, and build the program over time.
- Assess the level and diversity of support for a PBF. Engage key stakeholders (i.e., utilities; residential, commercial and industrial customers; municipalities; and environmental groups) and experts collaboratively to help design the program—including its administering organization, funding, duration, and evaluation methods.
- Design PBF legislation that sets a universal, non-bypassable SBC on utility bills. Set the charge at a rate that captures the available energy efficiency potential in the state. Consider specific language to prevent PBF funds from being commingled with general state budget funds, and to clarify that the SBC establishes a minimum level of investment in energy efficiency, not a cap on investments.
- Ensure that the PBF program serves the needs of diverse customer classes and stakeholder groups.
- Take care to select the most appropriate administering organization. The options include utilities, state agencies, or independent organizations. Each can be effective under the right conditions. Having a single entity administer the program statewide can maximize resource efficiency.
- Set the duration of the PBF for an extended period (five to 10 years is becoming common). This provides the continuity and certainty needed to attract private sector investment.
- Establish effective evaluation methods that build on proven approaches. Evaluation methods should be rigorous enough to estimate program impacts and other benefits, and simple enough to minimize administrative costs.

States that are concerned that their PBFs do not capture all of the cost-effective energy efficiency that is available are exploring how procurement requirements, portfolio management, or establishing

energy efficiency portfolio standards (EEPS) (see Section 4.1, *Energy Efficiency Portfolio Standards*) can help maximize the savings for their businesses and residents.

Utility Policies

PBFs can complement other state energy efficiency investments. In many states, PBFs supplanted energy efficiency programs that had been required by state utility commissions under IRP requirements. Some states, mostly those that have not restructured their electricity markets, still practice IRP and require regulated DSM programs for energy efficiency as utility resource investments. Washington still practices IRP and DSM, and Wisconsin and Oregon—while not restructuring retail markets—have shifted to a PBF efficiency program model. These non-restructured states are using PBFs to enhance funding for energy efficiency programs and ensure that programs are equitably distributed across customer classes.

In some states, a hybrid regulatory approach called portfolio management (PM) is evolving from traditional integrated resource plans. PM recognizes that utilities, under commission oversight, act as resource portfolio managers on behalf of its many customers. Under PM, a commission might elect to use a PBF to provide customers additional choices for energy efficiency investment and to balance the state's overall resource "portfolio" (see Section 6.1, *Portfolio Management Strategies*).

PBFs can also be combined with other resource acquisition strategies to ensure that cost-effective energy efficiency is pursued as part of the resource mix. California, for example, despite no longer operating as a restructured market, sustained its PBF and also developed new efficiency procurement requirements for utilities. The California Public Utilities Commission (CPUC), through the energy action plan (EAP), has established a "loading order" of energy resources for meeting future load growth. The loading order (1) minimizes increases in electricity and natural gas demand through energy efficiency and conservation measures, and (2) prioritizes renewable energy and clean distributed generation for meeting future load growth, followed by clean fossil-fired generation. The four investor-owned utilities (IOUs)

are required to procure future energy supply for the state using a combination of utility resource procurement funds and revenues from the PBF.

In addition, states are examining how PBFs may serve as the "ceiling" level for energy efficiency, rather than the "floor." In at least one state, the legislature capped energy efficiency funding at the level of the PBF. The concern is that this places artificial limits on the level of energy efficiency investments and may reduce opportunities for additional measures that are cost-effective and serve other public purposes (e.g., reliability support, job development). The Vermont legislature recently removed its "ceiling" provision (State of Vermont 2005).

Building Codes

PBF programs can be coordinated with energy codes for new and renovated buildings. For example, some states are using PBFs to support code implementation and enforcement. The New York State Energy Research and Development Authority (NYSERDA) offers financial incentives to building owners and leaseholders to improve the energy efficiency of new and existing construction. Other states, such as Illinois and Wisconsin, are using PBF resources to enhance voluntary new and existing buildings programs used to document code compliance. (See Section 4.3, *Building Codes for Energy Efficiency*, for more information.)

Program Implementation and Evaluation

State policymakers are responsible for determining who will implement the PBF and evaluate the program. The responsibilities of the administering organization include the following:

- Establish program goals, in terms of both process and outcomes.
- Set detailed funding levels for each program area (e.g., energy efficiency, renewable energy, CHP, low-income).
- Deliver energy efficiency field programs, and any related activities, such as research and development activities.

- Practice fiscal and project management that keep programs accountable and support attainment of objectives.

Program evaluation is either overseen by the program administrator, the PUC or other oversight authority, or a combination of the two. In most cases, these organizations outsource evaluation activities to independent third-party experts to minimize potential conflict of interest.

Administering Body

PBFs are placed under the control of an administrator, often with advisory oversight by an internal or external board. The organizational structures used to administer the PBF vary by state (see Table 4.2.1 on page 4-22). The administrative approaches used include:

- Utility (e.g., Arizona, Massachusetts, Rhode Island).
- State government agency (e.g., Illinois, Maine, Michigan, New Jersey, New York, Ohio, and Wisconsin).
- Nonprofit (third-party) organization (e.g., Oregon, Vermont). Oregon established a nonprofit organization based on action by the Oregon PUC; Vermont selected a nonprofit organization as part of a competitive process that included for-profit bidders.
- Hybrid category involving more than one of the preceding organizations. For example, a utility may administer the program with guidance and oversight by a state agency (e.g., California, Connecticut, and Montana).

States have developed effective programs using each administrative model; institutional history typically determines the entities best suited to administer programs. In many states, utilities have the capital, personnel, and customer relations channels that enable them to reach broad customer markets effectively. Thus, they are the most common administering entity.

However, in some states utilities might have little or no institutional history with energy efficiency. In others, state legislatures or utility commissions might

Best Practices: Implementing PBF Programs

- Learn from other states' experiences to identify most cost-effective ways to achieve energy efficiency through PBF programs.
- Consider a range of potential organization(s) for program delivery and select the most appropriate.
- Approve long-term funding cycles (five to 10 years) to let programs build market experience.
- Involve key stakeholders and experts in a collaborative design effort.
- Base program designs on market characteristics and customer needs.
- Keep program designs simple and clear.

express strong views toward other types of program delivery. In such situations, state agencies or non-profit organizations may be an appropriate administrator.

Some states have looked to independent organizations to administer PBFs. This decision may reflect a sense that this will help obtain maximum performance from program funds and avoid potential conflicts of interest (i.e., utilities whose revenues remain tied to sales may be reluctant to promote energy efficiency programs that may reduce their revenues). In some states, commissions are breaking the link between utilities' revenues and sales, thereby removing utilities' disincentive for investments in energy efficiency (see Section 6.2, *Utility Incentives for Demand-Side Resources*). Some states are also finding that it is appropriate to have different organizations administer specific energy efficiency programs funded by the PBF based on the market being served.

Evaluation

Evaluation is important for sustaining success and support for the PBF program and for helping determine future investment strategies. Unless program overseers show concrete and robust results in line with stated objectives, decisionmakers may not reauthorize the program, or it may become vulnerable to funding shifts or other forms of erosion. State policymakers have incorporated evaluation requirements as they develop their PBF program and after the program

has been implemented. When evaluating PBFs, several states have examined the TRC of the aggregated programs supported by the PBF (see section on *Determining Cost-Effectiveness* on page 4-24).

New York conducts an extensive evaluation of its PBF program. NYSEDA recently conducted a rigorous evaluation of its PBF program, including the following activities (NYSEDA 2004a):

- Identifies program goals and key output and outcome measures that provide indicators of program success.
- Reviews measurement and verification (M&V) protocols used to evaluate programs and verifies energy savings estimates to determine if they are reasonably accurate.
- Evaluates the process to determine how and why programs deliver or fail to deliver expected results.
- Characterizes target markets, determines changes observed in the market, and identifies to what extent these changes can be attributed to PBF-funded programs.
- Regularly communicates the benefits of the overall program and results of individual programs to decisionmakers and stakeholders.
- Refines program delivery models based on evaluation findings.

Other states that have conducted comprehensive evaluations of their PBF programs include California, Connecticut, Oregon, and Wisconsin. Key elements of these and other state evaluation programs are shown in the box on *Best Practices: Evaluating PBF Programs*.

Having access to detailed databases has also been a useful tool for evaluating current investments and determining future investments. For example, Efficiency Vermont maintains a database that records information on customer participation over time and allows for reporting on geographic and customer class results. Developing an arrangement to allow administrators to have access to this utility information can help improve the overall program.

Best Practices: Evaluating PBF Programs

- Evaluate programs regularly, rigorously, and cost-effectively.
- Use methods proven over time in other states, adapted to state-specific needs.
- Provide both "hard numbers" on quantitative impacts, and process feedback on the effectiveness of program operations and methods for improving delivery.
- Use independent third parties, preferably with strong reputations for quality and unbiased analysis.
- Measure program success against stated objectives, providing information that is detailed enough to be useful and simple enough to be understandable to nonexperts.
- Provide for consistent and transparent evaluations across all programs and administrative entities.
- Communicate results to decisionmakers and stakeholders in ways that demonstrate the benefits of the overall program, as well as individual market initiatives.
- Maintain a functional database that records customer participation over time and allows for reporting on geographical and customer class results.

State Examples

California

California has been a leader in energy efficiency policy and programs since the 1970s. It established the first major utility efficiency programs in the 1980s, and the first PBF in 1996. CPUC provides policy oversight of the state PBF. CPUC approves plans for efficiency programs in each of the utility service areas and also coordinates statewide activities. Further, CPUC requires utilities to use procurement funding to supplement the PBF in order to maximize cost-effective savings achieved through energy efficiency programs. The PBF is one part of a broader energy efficiency program entailing several policy initiatives, noted as follows.

As of 2004, California was the first state to establish cost-effective energy efficiency as the first option for acquiring new resources to meet future energy

demand, under its “loading order” rule. In January 2005, the CPUC adopted a new administrative structure in which the state’s four IOUs are responsible for program selection and portfolio management, with input from stakeholders through Program Advisory Groups (CPUC 2005). This is a return to a pre-electric industry restructuring model, in which each IOU was responsible for procuring energy efficiency resources on behalf of their customers, subject to Commission oversight.

The CPUC has established energy efficiency goals to achieve a cumulative savings of 23,183 gigawatt-hours (GWh) per year; 4,885 MW of peak demand; and 444 million therms per year for the IOUs combined, by 2013 (see Section 4.1, *Energy Efficiency Portfolio Standards*).

In September 2005, the CPUC authorized \$2 billion in funding for its 2006 to 2008 energy efficiency and conservation initiative. This represents the single largest funding authorization for energy efficiency in U.S. history. CPUC authorized funding levels and energy efficiency portfolio plans for Pacific Gas and Electric, Southern California Edison, San Diego Gas & Electric, and Southern California Gas. These portfolios include a mix of proven and new, innovative program designs and implementation strategies to be supported through ratepayer investments.

The measures associated with the approved funding are expected to avoid the equivalent of three large power plants (totaling 1,500 MW) over the next three years and over the life of the measures, yield an estimated \$2.7 billion in net savings to consumers, and reduce greenhouse gas emissions by 3.4 million tons of CO₂ in 2008, or the equivalent of taking about 650,000 cars off the road.

The state’s efficiency program design and administration approaches have been among the most detailed and innovative although initially they struggled with the complexity and coordination of multiple implementers. While utilities have remained administrators and portfolio managers of the programs with input from stakeholder working groups, program implementation is done by both utility and non-utility implementers, and statewide approaches

to program design and evaluation have improved program performance.

Web site:

http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/ee_funding.htm

New York

The New Yorks SBC program—administered by NYSERDA—is a leading example of a well designed and effectively administered state PBF program. The PBF was established in 1996 with four specific policy goals:

- Improve system-wide reliability and increase peak electricity reductions through end-user efficiency actions.
- Improve energy efficiency and access to energy options for underserved customers.
- Reduce the environmental impacts of energy production and use.
- Facilitate competition in the electricity markets to benefit end users.

NYSERDA has invested more than \$350 million in energy-efficiency programs and brought about an estimated additional investment of \$850 million, for a total of \$1.2 billion in public and private sector energy and efficiency related investments in the state. Over the eight-year implementation period (1998 to 2006), the program is expected to result in a total of \$2.8 billion in new public and private investment in New York.

NYSERDA measures and tracks its PBF investments and conducts quarterly and annual evaluations of the Energy \$mart program. It uses the findings to communicate the benefits of the program to its customers and stakeholders. NYSERDA analyzes the cost-effectiveness of the program, permanent and peak-load energy and cost savings to customers, economic impacts (including leveraged public and private sector investment and jobs created), and reductions of greenhouse gases and criteria pollutants. As of September 2004, the program had:

- Reduced electricity use by about 1,340 GWh per year; annual savings are expected to reach 2,700 GWh annually when the program is fully implemented.
- Generated \$185 million in annual energy bill savings for participating customers, including electricity, oil, and natural gas savings from energy efficiency and peak load management services.
- Created 3,970 jobs annually, and is expected to result in an average net gain of 5,500 jobs per year during the eight years of program implementation from 1998 to 2006.
- Reduced nitrogen oxide (NO_x) emissions by 1,265 tons, sulfur-dioxide (SO₂) emissions by 2,175 tons, and CO₂ emissions by 1 million tons (the equivalent amount of energy required to power about 850,000 homes) (NYSERDA 2004b).

Web site:

<http://www.nyserda.org>

Oregon

Oregon is an example of a state that has not restructured its electricity markets, but has created a public benefits program designed to serve public needs for energy efficiency services. Rather than using utilities as the primary administrator for programs, Oregon uses the nonprofit Energy Trust of Oregon as a dedicated organization to coordinate program design, evaluation, and delivery across the state. The Trust administers the state PBF in coordination with the PUC, providing cash incentives and financial assistance to promote energy efficiency and renewable energy.

While the PBF program is relatively new in Oregon, it builds on the success of other programs, such as Vermont's nonprofit delivery model, and the Northwest Energy Efficiency Alliance's market transformation programs. While utility administration is the most common model used in state PBFs, Oregon and Vermont have shown that a nonprofit structure can be equally effective.

The Energy Trust's programs, which started later than many states' efforts, saved 280 million kWh and 208,000 therms of gas by 2003, enough energy to power 23,000 homes. Its 2012 goal is to save 26 billion kWh and 19 million therms, enough to power over 200,000 typical homes.

Oregon is also one of the few states that supports both electricity and natural gas efficiency programs, and that complements its PBF program with ratemaking policies that maintain utility revenues while promoting energy use reductions.

Web site:

<http://www.energytrust.org/>

Wisconsin

Focus on Energy is a public-private partnership funded by the state PBF. The program's goals are to encourage energy efficiency and use of renewable energy, enhance the environment, and ensure the future supply of energy for Wisconsin.

A recent independent evaluation of the Wisconsin's Focus on Energy program showed the program is delivering the following energy, environmental, and economic benefits:

- The Focus on Energy program realized a total lifetime energy savings of \$214.5 million during fiscal year 2004 for a program benefit:cost ratio of 5.4 to 1. These benefits were achieved through an annual electric energy savings of 235.6 million kWh (\$113.1 million in lifetime savings), a reduction in electricity demand of 35.5 megawatts (\$36.4 million in lifetime savings), and savings of 14.4 million therms from natural gas efficiency measures (\$65 million in lifetime savings). See the *Evaluation* section on page 4-28 for more information.
- Wisconsin environmental benefits include estimates of the following avoided emissions: 1.5 million pounds of NO_x, 2.9 million pounds of sulfur oxides (SO_x), 687.3 million pounds of CO₂, and 12 pounds of mercury (Hg) (WI DOA 2004).

Economic benefits from the Wisconsin program include the creation of 1,050 full-time jobs. Wisconsin businesses saved almost \$14.6 million and increased sales by \$76.7 million. Wisconsin residents saved almost \$20 million and increased their personal income by \$18.3 million.

Web site:

<http://www.focusonenergy.com/>

What States Can Do

Experience from the states with PBFs for energy efficiency demonstrates that PBFs can be an effective mechanism for securing investment in cost-effective energy efficiency programs and thereby meeting important state energy objectives. Other states can improve their energy efficiency investments by examining the role PBFs can play in helping capture a significant portion of the cost-effective clean energy in their state. States can use the best practices and information resources in this guide to establish a new PBF or strengthen existing programs to deliver even greater benefits.

Action Steps for States

The following four steps can be used both by states interested in developing a new PBF program or those interested in strengthening an existing program.

- *Assess Energy Efficiency Potential.* States can begin the process by assessing current levels of energy efficiency spending within their state, analyzing all of their options for achieving greater levels of efficiency, and analyzing the energy and cost savings that a PBF would offer.
- *Determine Program Funding Needed to Capture Cost-Effective Energy Efficiency.* Consider appropriate PBF funding levels, and avoid diversion of funds for other purposes. Studies show energy efficiency spending could be increased significantly and still be used cost-effectively. Conduct an efficiency potential analysis and economic screening process to identify the most cost-effective mix of new program targets. Include consideration of energy efficiency's role as a potential reliability tool and how its costs in that context compare to other options.
- *Leverage Federal and State Programs.* Explore opportunities to work with federal programs such as ENERGY STAR and to coordinate PBF implementation with other state programs, such as resource planning and portfolio management.
- *Measure and Communicate Results.* Measure results, evaluate the effectiveness of the PBF, and report progress annually. Communicate the benefits of PBF-funded energy efficiency programs to state legislatures, PUCs, and other stakeholders. Document lessons learned and opportunities to enhance the program's effectiveness.

Information Resources

Information About States

Title/Description	URL Address
California Measurement Advisory Council (CALMAC). This Web site provides access to independent evaluation reports on energy efficiency programs in California and elsewhere.	http://www.calmac.org/
California Order Instituting Rulemaking to Examine the Commission's Future Energy Efficiency Policies, Administration and Programs: Interim Opinion on the Administrative Structure for Energy Efficiency: Threshold Issues (Rulemaking 01-08-028). This order addresses threshold issues on administrative structure including planning, oversight, and management of energy efficiency programs, including decisions on what programs to fund with ratepayer dollars.	http://www.cpuc.ca.gov/word_pdf/FINAL_DECISION/43628.doc
California PUC Energy Efficiency Program Funding. This site provides information on the state's public goods charge with links to legislative language and the Web sites of California's four utilities.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/ee_funding.htm

Title/Description	URL Address
California Standard Practice Manual: Economic Analysis of Demand Side Programs and Projects. This document provides standardized procedures for evaluating cost-effectiveness of demand-side programs and projects in California.	http://www.cpuc.ca.gov/static/industry/electric/energy+efficiency/rulemaking/resource5.doc
Cost-Effectiveness Policy and General Methodology for the Energy Trust of Oregon. In this paper, the Energy Trust of Oregon, Inc. describes its methodology for comparing the cost of energy efficiency to conventional sources of electric energy from three perspectives (i.e., consumer, utility system, and societal).	http://www.energytrust.org/Pages/about/library/policies/costeffectiveness_030414.pdf
Energy Programs Consortium: Options for Developing a Public Benefits Program for the State of Kansas. The purpose of this report was to explore options for establishing a PBF to support the delivery of energy efficiency and renewable energy programs to help reduce the state's need to import energy resources and thereby strengthen the state's economy.	http://www.kansasenergy.org/KEC/KsPubBenFundStudy2004.pdf
Energy Trust Annual Report, 2004. This document reports on state PBF savings and generation, revenues and expenditures, performance measures, and specific projects around the state.	http://www.energytrust.org/Pages/about/library/reports/2004_Annual_Report.pdf
Nevada Energy Efficiency Strategy. Nevada has taken a number of steps to increase energy efficiency. This report provides 14 policy options for further increasing the efficiency of electricity and natural gas, and reducing peak power demand.	http://www.swenergy.org/pubs/Nevada_Energy_Efficiency_Strategy.pdf
NYSERDA Energy \$martSM Evaluation Reports. This Web site contains program evaluation reports developed by NYSERDA and its contractors.	http://www.nyserdera.org/Energy_Information/evaluation.asp
A Proposal for a New Millennium. This proposal includes a summary of the California Energy Commission's (CEC's) key recommendations for energy efficiency program priorities, funding levels, and administrative structure.	http://www.energy.ca.gov/reports/1999-12_400-99-020.PDF
Regulatory—Energy Efficiency Filings. This Web site contains monthly program reports on energy efficiency filed by SCE, Rosemead, CA.	http://www.sce.com/AboutSCE/Regulatory/ee filings/MonthlyReports.htm
State of Wisconsin Department of Administration—Focus On Energy Evaluation Reports. This site provides a number of recent evaluation reports that enumerate energy, environmental, and economic benefits from the Focus on Energy program.	http://www.doa.state.wi.us/section_detail.asp?linkcatid=288&linkid=8
System Benefits Charge. Proposed Operating Plan for New York Energy \$mart Programs (2001–2006). This report outlines NYSERDA's operating plan for administering the PBF program in New York.	http://www.cleanenergystates.org/library/ny/NYSERDA_SBC_2001-2006.pdf
Wisconsin Public Benefits Programs Annual Report July 1, 2003 to June 30, 2004. This report includes an evaluation of Focus on Energy, the Wisconsin PBF for energy efficiency.	http://www.cleanenergystates.org/library/wi/2004FocusAnnualReport.pdf

General Articles About PBFs

Title/Description	URL Address
Clean Energy Initiative. This report explores the potential for joint investment in clean energy by foundations, state funds, and private investors.	http://www.cleanenergystates.org/library/Reports/CEI_Final_July03.pdf
Clean Energy States Alliance—CESA Member States and Funds. This Clean Energy States Alliance (CESA) Web site provides links to the state PBF sites.	http://www.cleanenergystates.org/Funds/
An Examination of the Role of Private Market Actors in an Era of Electric Utility Restructuring. The report by the American Society for an Energy-Efficient Economy (ACEEE) examines the role of the private sector in promoting energy efficiency and briefly discusses the influence of PBFs.	http://www.aceee.org/pubs/u011full.pdf
Five Years In: An Examination of the First Half-Decade of Public Benefits Energy Efficiency Policies. This ACEEE report provides an in-depth discussion and evaluation of PBF policy and implementation at the state level.	http://www.aceee.org/pubs/u041.pdf
A Framework for Planning and Assessing Publicly Funded Energy Efficiency. The primary objective of this report is to discuss the assessment of the cost-effectiveness of market transformation interventions.	http://www.pge.com/docs/pdfs/rebates/program_evaluation/evaluation/EE_Report_Final.pdf
Options for Developing a Public Benefits Program for the State of Kansas. This white paper describes current models of PBFs with recommendations for the state of Kansas on developing a PBF.	http://www.kansasenergy.org/KEC/KsPubBenFundStudy2004.pdf
Ratepayer-Funded Energy-Efficiency Programs in a Restructured Electricity Industry: Issues and Options for Regulators and Legislators. This report by Ernest Orlando, Lawrence Berkeley National Laboratory (LBNL) and ACEEE, discusses features of PBFs and provides recommendations for designing a PBF and choosing an administering body.	http://eetd.lbl.gov/ea/EMS/reports/41479.pdf
Summary Table of Public Benefit Programs and Electric Utility Restructuring. This site provides information, compiled by ACEEE, in tables on energy efficiency and renewable energy PBFs by state. It includes information on funding levels, the charge per kWh, the percentage of revenue, and the administering organization.	http://aceee.org/briefs/mktabl.htm
System Benefits Funds for Energy Efficiency. This report by the National Conference of State Legislatures (NCSL) describes how states can use system benefits funds to support energy efficiency investments. It provides sample legislative language for SBC legislation.	http://www.ncsl.org/print/energy/SystemBenefit.pdf
Trends in Utility-Related Energy Efficiency Spending in the United States. This presentation, at an AESP Brown Bag Lunch Series, shows general trends as well as specific state examples of energy efficiency spending.	http://www.raonline.org/Slides/AESP04kushler.pdf

Examples of Legislation

State	Title/Description	URL Address
California	Assembly Bill 1890 on restructuring. This bill, enacted in September 1996, established California's PBF.	http://www.leginfo.ca.gov/pub/95-96/bill/asm/ab_1851-1900/ab_1890_bill_960924_chaptered.html
Massachusetts	Massachusetts Electricity Restructuring Act of 1997. This act established the PBF program in Massachusetts.	http://www.mass.gov/legis/laws/seslaw97/sl970164.htm
New York	A New York Public Service Commission Order and Opinion (PSC Case No. 94-E-0952: Opinion No. 96-12, May 1996). This order established the PBF program in New York.	http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/E05EBC3E5C3E79B385256DF10075624C/\$File/doc886.pdf?OpenElement
	A New York Public Service Commission Order and Opinion (PSC Case No. 94-E-0952: Opinion No. 98-3, January 1998). This order discusses PBF implementation issues and identifies NYSEDA as the administering organization.	http://www3.dps.state.ny.us/pscweb/WebFileRoom.nsf/ArticlesByCategory/86EBE0283819224285256DF100755FE5/\$File/doc3640.pdf?OpenElement
Oregon	Oregon Senate Bill 1149. This bill contains legislative language outlining restructuring and establishing a PBF.	http://www.leg.state.or.us/99reg/measures/sb1100.dir/sb1149.en.html
Wisconsin	New Law on Electric Utility Regulation—The "Reliability 2000" Legislation (Part of 1999 Wisconsin Act 9). This informational memorandum describes the provisions in 1999 Wisconsin Act 9 (the 1999–2001 Biennial Budget Act), relating to public utility holding companies, electric power transmission, public benefits, and other aspects of electric utility regulation.	http://www.legis.state.wi.us/lc/3_COMMITTEES/JLC/Prior%20Years/jlc99/pubs/im99_6.pdf

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CEC. 2005. Funding and Savings for Energy Efficiency Programs for Program Years 2000–2004. Cynthia Rogers, Mike Messenger and Sylvia Bender, Energy Efficiency, Demand Analysis and Renewable Energy Division, California Energy Commission. July 11, 2005.	http://www.energy.ca.gov/2005_energypolicy/documents/2005-07-11_workshop/presentations/2005-07-11_FUNDING+SAVINGS.pdf

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WI DOA. 2004. Wisconsin Public Benefits Programs Annual Report July 1, 2003 to June 30, 2004. Department of Administration (DOA), Division of Energy, Madison, WI.	http://www.cleanenergystates.org/library/wi/2004FocusAnnualReport.pdf

4.3 Building Codes for Energy Efficiency

Policy Description and Objective

Summary

Building energy codes require new and existing buildings undergoing major renovations to meet minimum energy efficiency requirements. Well-designed, implemented, and enforced codes can help eliminate inefficient construction practices and technologies with little or no increase in total project costs. Codes typically specify requirements for “thermal resistance” in the building shell and windows, minimum air leakage, and minimum heating and cooling equipment efficiencies. These simple measures can reduce energy use by 30% or more, resulting in cost savings for businesses and consumers. Building energy codes also reduce peak energy demand, air pollution, and greenhouse gas emissions. Recognizing these benefits, a majority of states have adopted building energy codes in some form for residential and commercial construction (DOE 2005).

Broadly speaking, building codes include an array of specifications and standards that address safety and functionality. In 1978, California became the first state to include energy requirements in its code. Today, 43 states (including Washington, D.C.) use a version of the Model Energy Code (MEC), the International Energy Conservation Code (IECC), or their own equal-or-better energy codes for residential buildings. Forty-one states (including Washington, D.C.) use the ASHRAE or IECC standard for commercial buildings (Prindle et al. 2003, BCAP 2005a).

While state and local governments have made progress in improving building efficiency through codes, there continue to be cost-effective opportunities for further efficiency savings. States with existing codes are conducting periodic updates and finding ways to improve compliance by monitoring, evaluating, and enforcing their codes. States without building energy codes are initiating stakeholder discussions and formal studies to evaluate whether

Building energy codes for residential and commercial buildings lock in the benefits of cost-effective energy efficiency in new construction and major renovation of existing buildings.

codes make sense in their area. In some cases, local governments are adopting or modifying codes specific to their jurisdictional boundaries.

The potential energy savings from further state action can be significant. If all states adopted the most recent commercial and residential model energy codes, improved compliance levels, and applied model energy codes to manufactured housing, the United States would reduce energy use by about 0.85 quads annually, with cumulative savings through 2020 of about five quads. (One quad is about equal to the amount of energy contained in 167 million barrels of crude oil.) In 2020, annual consumer energy bill savings would be almost \$7 billion, and the construction of 32 new 400 megawatt (MW) power plants could be avoided. Of course, each state’s savings depends on many factors: the efficiency of its current building practices; the stringency of the code it adopts; its population, climate, and building construction activity; and the effectiveness of code training and enforcement (Prindle et al. 2003).

Objective

Building energy codes establish a minimum level of energy efficiency for residential and commercial buildings. This can reduce the need for energy generation capacity and new infrastructure while reducing energy bills. States are also finding that energy codes lock in future energy savings during the building design and construction process. In contrast, achieving post-construction energy savings can be comparatively expensive and technically challenging. Codes become even more cost-effective during periods of high heating and cooling fuel prices.

States and municipalities are updating existing codes, adopting new codes, and expanding code programs to improve compliance and achieve real

energy and financial savings. With energy consumption expected to rise 20% in the residential sector and 19% in the commercial sector by 2020, enacting building codes is a key strategy for dampening growth in energy consumption across the buildings sector. Some states are promoting "beyond code" building programs to achieve additional cost-effective energy efficiency.

Benefits

State and local governments are seeing a range of benefits from building codes, including lower energy use, an improved environment, and economic growth. Each is discussed as follows.

Energy codes provide minimum levels of energy efficiency in commercial and residential buildings. This lowers overall energy consumption, provides energy bill savings, and can reduce peak energy demand and resulting pressure on the electric system. For example, California's building standards have helped save businesses and residents more than \$15.8 billion in

Why Building Energy Codes Help

Economic theory suggests that today's high energy prices should drive the new building market towards high levels of energy efficiency. However, states and municipalities are finding that market barriers sharply limit these effects, including:

- **Split Incentives.** Whereas builders typically bear the capital cost of energy efficiency improvements, homeowners and tenants see the benefits of lower energy bills. Since most builders do not occupy the building and pay energy bills, they lack an incentive to incorporate efficiency features that result in cost savings.
- **Customer Preferences.** Most home purchase decisions and feature selection is driven by nonenergy factors. In selecting optional features for the home, buyers often focus on amenities like kitchen upgrades, extra bathrooms, and new flooring. Efficiency competes with these priorities.

In the presence of multiple barriers, energy codes can ensure that new buildings achieve a basic level of energy efficiency performance that is cost-effective and delivers related benefits.

Residential and Commercial Building Energy Codes

The energy code that applies to most *residential* buildings is the IECC, which supersedes the MEC. The 2000 IECC is the most recent version for which DOE has issued a positive determination. However, different versions of the MEC/IECC have been adopted by states, creating a patchwork of residential codes across the country. The federal Energy Conservation and Production Act (ECPA) was amended in 1992 to require states to review and adopt the MEC (and its successor, the IECC), or submit to the Secretary of Energy its reasons for not doing so.

Most *commercial* building energy codes are based on ASHRAE/IESNA Standard 90.1, jointly developed by ASHRAE and the Illuminating Engineering Society (IES). ECPA requires states to adopt the most recent version of ASHRAE Standard 90.1 for which DOE has made a positive determination for energy savings, currently 90.1-1999. The IECC also contains prescriptive and performance commercial building provisions. By referencing Standard 90.1 for commercial buildings, IECC offers designers alternate compliance paths.

electricity and natural gas costs since 1975, and these savings are expected to climb to \$59 billion by 2011 (CEC 2003). In addition, California's new 2005 building efficiency standards are expected to yield peak energy use reductions of 180 MW annually—enough electricity to power 180,000 average-sized California homes (Motamedi et al. 2004).

The American Council for an Energy-Efficient Economy (ACEEE) estimates that upgrading residential building codes could save an "average" state about \$650 million in homeowner energy bills over a 30-year period (Prindle et al. 2003).

States and municipalities are also finding that energy codes improve the environment by reducing air pollution and greenhouse gases. For example:

- The New York Energy Conservation Construction Code (ECCC) reduces carbon dioxide (CO₂) emissions by more than 500,000 tons annually and reduces sulfur dioxide (SO₂) by nearly 500 tons per year (DOE 2002).

- The 2001 Texas Building Energy Performance Standards are projected to reduce nitrogen oxide (NO_x) emissions statewide by more than two tons each peak day and over one ton each average day, which helps the state meet Clean Air Act requirements for nonattainment areas (Haberl et al. 2003).

Building energy codes can also help grow the economy. States and municipalities benefit from greater investment in energy-efficient capital equipment and new jobs installing equipment and monitoring building compliance. While spending on energy services typically sends money out of state, dollars saved from efficiency tend to be re-spent locally (Kushler et al. 2005, Weitz 2005a).

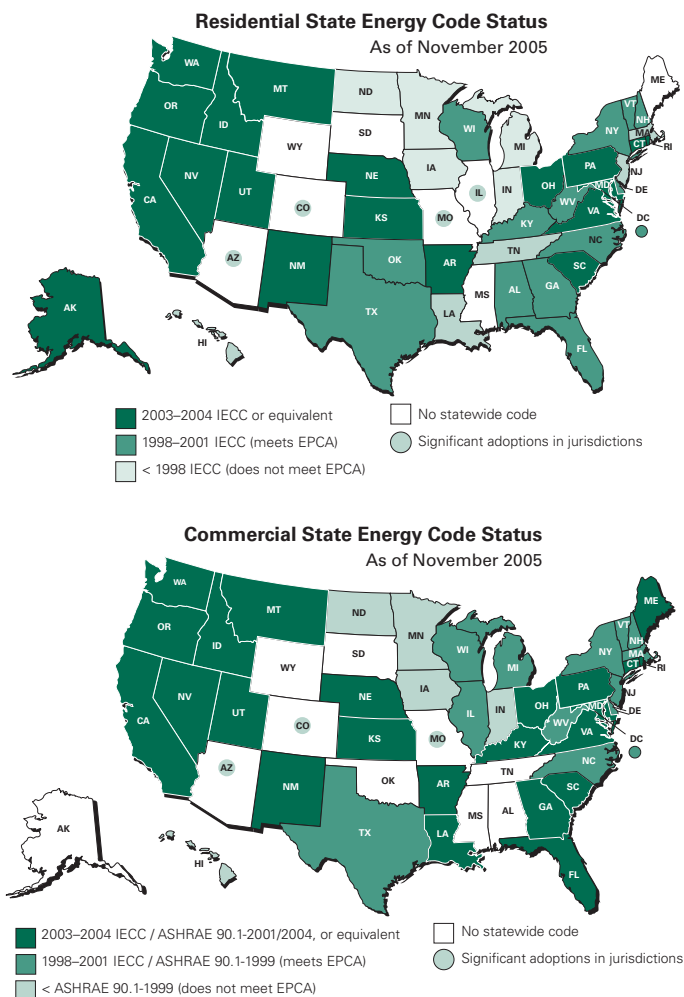
States with Building Energy Codes

As of November 2005, 43 states (including Washington, D.C.) use a version of the MEC, the IECC, or their own equal-or-better energy codes for residential buildings. Thirty-three of these 43 states are using the latest IECC version that the U.S. Department of Energy (DOE) has determined would improve the energy efficiency of residential buildings, or better. Only 10 states have not adopted a statewide code, although many jurisdictions in four of these states have adopted the 2003 IECC (Prindle et al. 2003, BCAP 2005a, Weitz 2005b).

A total of 41 states (including Washington, D.C.) use a version of the ASHRAE or IECC standard for commercial buildings. Thirty-six states are using the latest ASHRAE 90.1 standard for which DOE has made an energy efficiency determination, or better. Ten states have not adopted a commercial building code, although many jurisdictions within three of these states have adopted the 2003 IECC. While substantial progress has been made, many states and municipalities are regularly finding new opportunities to incorporate new technologies and features into their codes (Prindle et al. 2003, BCAP 2005a, Weitz 2005b).

State and local government experience demonstrates that policy adoption is only the first step—proper

Figure 4.3.1: States with Residential and Commercial Building Energy Codes



Source: BCAP 2005a.

implementation, evaluation, and enforcement are also necessary. In states where these components are missing, full compliance rates can fall short. For example, a 2001 study showed that compliance of less than 50% in the new homes market can occur even in states with strong code training programs (XENERGY 2001).

Leading states are not only monitoring and evaluating their energy codes, but also using the findings from these analyses to take corrective action. In California, a field evaluation of air conditioning units found that incorrect levels of “refrigerant charge”

were compromising energy performance. The 2005 Title 24 Standards correct this problem by requiring verification of proper charge quantities by a home energy rater or documentation that a thermal expansion valve was installed (CEC 2005b). This illustrates the importance of maintaining active support for a range of evaluation and enforcement programs after codes are adopted into law.

Most states and municipalities periodically update their building energy codes, some more frequently than others. This process ensures that codes reflect changes in technology and design that offer increased energy efficiency and cost-effectiveness. Across states, it is common for code reviews to be triggered by the release of a new national model code or DOE's determination of improved energy efficiency. Some jurisdictions even introduce state- or local-specific requirements into the model code development process, sharing their experiences nationally.

Designing an Effective Building Code

Actions that states take when adopting new or updating existing codes include identifying key participants, analyzing cost considerations, determining a time frame for action, and evaluating interactions with other state and federal policies.

Participants

- *Government Officials.* Model building energy codes for the residential and commercial sectors are developed at the national level by model code organizations, such as the International Code Council (ICC) and ASHRAE. States and large local jurisdictions have been the predominant backers and participants in maintaining these model codes. DOE is required by the ECPA to participate in the review and modification of the codes. Code implementation is conducted at the state and local levels and enforced by local governments (DOE 2005). States often modify the national model codes to account for needs and opportunities specific to their climate, geography, and economy.

ECPA requires DOE to make determinations regarding national model codes. This means that DOE periodically evaluates new editions of the model codes (the IECC and Standard 90.1) and determines whether the new edition will improve the efficiency of residential or commercial buildings. If DOE makes a positive determination on a new residential model code, states must *consider* adopting it within two years. If they elect not to adopt the code, state officials are required to submit their reasoning to the U.S. Secretary of Energy. In contrast, if DOE makes a positive determination on a new commercial sector code, states are required to adopt it within two years. In practice, however, states demonstrate compliance through a self-certification process and there are no major repercussions for failing to adopt new commercial codes.

Under ECPA, DOE also provides technical and grant assistance to states to facilitate building code adoption and implementation. DOE operates through centers of expertise such as the Pacific Northwest National Laboratory (PNNL) to help states chart a course of action. Examples of PNNL technical assistance include conducting studies of current building practices (to develop baselines), quantitative analysis of potential benefits, legislative and regulatory assessments, training and technical assistance for builders and code officials, and other services available at: <http://www.energycodes.gov>.

More recently, the Energy Policy Act of 2005 (EPAct 2005) amended ECPA to authorize DOE to provide funding for states that implement a plan to achieve 90% compliance with residential (IECC 2004) and commercial (ASHRAE 90.1-2004) building codes. In states without a building code, DOE is authorized to provide similar funding to local governments that are taking action on building codes.

While most states have the authority to adopt energy codes statewide, some states have "home rule" laws that limit their ability to impose building requirements on municipalities. In these states, local governments can adopt their own codes. For example, two Arizona cities, Phoenix and Tucson,

are taking this approach (and thereby affecting a large portion of the state's overall building stock). Alternatively, home rule states can revise existing law to allow for statewide building energy codes. Texas followed this approach, primarily in an effort to improve the state's air quality.

- *Builders, Developers, and Building Owners.* Builders, developers, and building owners are responsible for implementing provisions in the code language. States and municipalities are finding that active collaboration with these groups improves understanding, creates buy-in, and can lead to greater levels of compliance. States such as California, Minnesota, and Florida have a history of working closely with the building community (Prindle et al. 2003).
- *Code Developers.* In the United States the ICC, ASHRAE, and the National Fire Protection Association (NFPA) develop model energy codes and standards. The ICC develops the IECC for residential buildings, while ASHRAE maintains the 90.1 standards for commercial buildings and 90.2 for residential buildings. Both ICC and NFPA provide a reference to ASHRAE Standard 90.1 as an alternate compliance path for commercial buildings. To facilitate ease-of-adoption by states, these documents are written as model codes that can be adopted as is, or modified to suit state or local needs. Another role for code developers is to provide training and technical support to code officials. The ICC serves in this capacity to assist with interpretation and implementation of residential codes.
- *Nongovernment Organizations.* Nongovernment organizations support building energy code adoption and implementation by fostering peer exchange, serving as information sources, and providing expert assistance. For example, the Building Codes Assistance Project (BCAP) offers tailored technical assistance to states and municipalities. In states seeking to adopt the IECC or ASHRAE 90.1, BCAP provides services such as educational support for code officials and legislators, as well as implementation assistance. The organization is a joint initiative of the Alliance to Save Energy (ASE), ACEEE, and the Natural Resources Defense Council (NRDC).

The Residential Energy Services Network (RESNET) promotes codes by fostering national markets for home energy rating systems and energy-efficient mortgages that go beyond codes. RESNET develops home energy rating systems, accredits home energy rating trainers and providers, promotes residential energy efficiency financing products, and conducts educational programs. To encourage consistency across rating systems, the organization works to align its standards to the IECC.

Cost Considerations

Upgrading the energy efficiency of new homes and commercial buildings is very cost effective. A recent study estimated that upgrading the energy efficiency of a typical new home to comply with the model energy code in Nevada would cost about \$1,500 on average but would result in about \$400 in annual energy bill savings, meaning a simple payback of less than four years. Likewise, this study estimated that upgrading the energy efficiency of commercial buildings to comply with the code would cost about \$1.60 per square foot but would result in about \$0.68 per square foot of energy bill savings per year, meaning a simple payback of about 2.4 years (Geller et al. 2005).

The efforts of national code development organizations ensure that each state does not incur the full cost of developing its own codes. The ICC, ASHRAE, and NFPA offer model energy codes that are developed with stakeholder input and written to promote transferability. However, some states (e.g., California and Florida) and municipalities choose to initiate their own code development process. Although most find that using model codes saves the expense and time of developing a new code, it is common for states to initiate a review-and-modification process that amends the model codes to reflect state-specific considerations. Another way that state and local governments lower costs is by using technical and grant assistance from DOE and nongovernment organizations to fund their code development, adoption, or enforcement process.

When adopting a model code, states typically provide resources to municipalities to support implementation and enforcement. Local funds are used to help code officials and builders understand and comply with the code's requirements. Municipalities also lower costs by using home energy rating systems (HERS) to demonstrate compliance with the energy code. These systems indicate the energy efficiency of a home and are typically funded by the local government or the builder.

However, even where state and federal resources are available to municipal code officials, cities are finding that staff coverage for code enforcement is often stretched thin. To overcome this barrier, some local governments collaborate with state officials to help meet resource and assistance needs. For example, the Texas Energy Partnership is a consortium of state, federal, and local agencies—as well as universities and other non-government partners—created to help municipalities throughout Texas establish procedures for administration and enforcement of code requirements adopted under Senate Bill 5 (S.B.5). The partnership offers technical assistance and access to state and federal experts that help municipalities comply with code provisions and save money on energy bills (AACOG 2005).

Timing and Duration

State and local experience with building energy codes shows that the time of building design and construction represents a low-cost opportunity to integrate energy efficiency into a structure. Decisions made at this time often cannot be remedied later or can only be revised at significant cost.

States are also finding they can increase code effectiveness by regularly updating code specifications. A periodic review of energy code requirements is a strategic way to ensure that opportunities associated with new building sector technology are captured. States often time their reviews to coincide with updates of national-level model codes by the code development organizations or the issuance of a DOE determination. This approach offers regular opportunities for states and municipalities to simultaneously

provide input to the model code development process and to update their own codes. Other states call for updates on a regular basis. For example, Massachusetts reviews its code every five years while some other states do so every three years (e.g., California, Idaho, Maryland, Montana, New Mexico, and Pennsylvania). As a rule of thumb, states take action if the code is more than five years old, if there is no evidence of consistent enforcement, or if there is no state energy code.

When code development organizations release a new version of a model code (and DOE makes a positive determination about its effectiveness), states are required by the Energy Conservation and Production Act (EPCA) to respond accordingly. On the residential side, new versions of the IECC are released every three years with an interim supplement released in between. While adoption is not required for residential codes, it is mandatory for new versions of the commercial sector ASHRAE 90.1 code. ASHRAE 90.1 has historically been revised and republished less frequently than the IECC (there was a decade gap between the 1989 and 1999 versions). It is now scheduled for release on a three-year cycle. The most recent version is 90.1-2004.

State experience with the review and update process demonstrates that it is important to anticipate and plan for the education and training needs of code officials, builders, contractors, and other affected parties. Each participant requires a period of time to identify and understand new requirements and changes to existing regulation. Code changes also affect product manufacturers and suppliers, who need lead-time to clear current inventories and ensure that newly compliant products are available when the revised code takes effect.

Interaction with Federal Programs

State and local governments are finding that voluntary programs such as ENERGY STAR can help the building community move beyond code-mandated efficiency levels in the new housing stock. An ENERGY STAR-qualified new home is at least 30% more efficient than a home built to the model energy code

Best Practices for Developing and Adopting Building Codes

States and municipalities have identified the following best practices to help states update existing building energy codes and adopt new codes:

- *Do Your Homework.* Evaluate current building energy code laws, as well as options for implementation and enforcement. If there is no state energy code, if it is more than five years old, or if there is no evidence of consistent enforcement, it may be time to act:
 - Conduct an analysis of the benefits and costs of code adoption and implementation.
 - Talk with key stakeholders—including local officials and builders—to hear their concerns, assess their experience with energy codes, and gauge their perspectives.
 - Assess resources for training and other forms of technical support for code officials, builder associations, and building supply organizations.
 - Contact materials suppliers to learn about availability of compliant products.
- *Obtain Outside Help.* Implementing and enforcing codes requires a high level of engineering expertise that many code officials do not have. Several organizations provide resources to help. For example, DOE's Pacific Northwest National Laboratory, the Building Codes Assistance Project, and the New Buildings Institute can assist in charting a course of action. This action might include quantitative assessments of potential benefits, baseline building practice studies, legislative and regulatory assessments, training and technical assistance for builders and code officials, and other services.
- *Create a Stakeholder Process.* Involve key stakeholders early and regularly. Include them in reviews of studies, proposal regulations, and other aspects of the process. Involving stakeholders helps ensure the codes are appropriately designed. This process increases the chances of code adoption and minimizes enforcement problems.

and 15% more efficient than one built to local code. To certify an ENERGY STAR home, the builder may guide construction to this performance specification—as verified by a HERS—or build to a prescribed set of requirements outlined in a Builder Option Package (BOP). BOPs contain requirements for

insulation levels, air infiltration, windows, and heating and cooling equipment. The relevant set of BOP requirements depends on climate conditions and is third-party verified.

To encourage the construction of ENERGY STAR-qualified new homes, state and local governments are using marketing and outreach campaigns, training builders, and assisting builders in rating their homes. New York's Energy \$mart initiative has an active ENERGY STAR new homes program that emphasizes education and training for builders, local officials, and other stakeholders. Since its inception in 2001, more than 4,000 homes have been constructed and qualified in the state. New York is finding that voluntary above-code programs complement and go beyond traditional regulatory approaches to ensure a continuous stream of building energy savings (New York Energy \$mart 2005).

Interaction with State Policies

State and local policymakers are leveraging other state clean energy policies to support building energy codes. For example, some states are using public benefits funds (PBFs) to support code implementation and enforcement. The New York State Energy Research and Development Authority (NYSERDA) offers financial incentives to building owners and leaseholders to improve the energy efficiency of new and existing construction (NYSERDA 2004). Other states, such as Illinois and Wisconsin, are using PBF resources to enhance voluntary new and existing buildings programs used to document code compliance (MEEA 2002).

Several state and local governments are investigating the extent to which building codes improve air quality, and whether this benefit can be incorporated into their air quality planning process. Codes improve air quality by reducing energy consumption in buildings, thereby lowering electricity generation and resulting pollution from power plants. In some states and cities, code officials are beginning to collaborate with air quality planners on how these benefits can be captured in State Implementation Plans (SIPs) for regulated air pollutants. S.B.5 in Texas is an example of legislation mandating building energy efficiency

for the explicit purpose of improving the state's ozone air quality (see *State Examples* section on page 4-46).

Program Implementation and Evaluation

Implementation

States and municipalities are finding innovative ways to implement building codes and achieve significant savings. By addressing the following commonly encountered barriers, they can increase their likelihood of success:

- *The Size and Fragmentation of the Building Industry Slows Technology Advancement.* While there are fewer than a dozen U.S. manufacturers of automobiles, home appliances, and light bulbs, there are approximately 150,000 home building companies in the United States. And in contrast to highly automated sectors of the U.S. economy, the building sector remains largely a craft industry dependent on the integration of hundreds of components from various manufacturers by onsite crews and subcontractors. To overcome this barrier, many states provide training and education services to these groups. For example, the Texas State Energy Conservation Office (SECO) works in partnership with the Texas Association of Builders to provide classroom and online training for homebuilders and subcontractors. Their program focuses on the importance of well-designed and properly installed energy and moisture management systems. Outreach materials are available in both Spanish and English.
 - *Energy Efficiency Is Typically Not a Top Customer Preference.* This can serve as a barrier to code implementation and enforcement (though not necessarily code adoption). Most home purchase decisions and feature selection are driven by non-energy factors. For example, buyers are often more focused on amenities like kitchen upgrades, extra bathrooms, or new flooring. Efficiency features compete with these highly visible priorities.
- In states where energy efficiency is not a top customer preference, it is often because awareness is low. Evidence from a Massachusetts energy code evaluation indicates that homebuyers rarely ask builders about the beneficial energy efficiency characteristics of their prospective homes (XENERGY 2001). By inquiring about measures such as proper heating, ventilation, and air conditioning (HVAC) equipment sizing and duct insulation, consumers can avoid problems such as high utility bills, poor ventilation, differential heating and cooling of rooms in the house, and reduced comfort. Since consumers drive the market, some states are turning to education as an important component of code implementation efforts.
- *Surveys Indicate That Mandatory Energy Codes Are Often Not Complied With Because They Are Too Complex and Difficult to Understand.* As a result, states are finding that having an energy code in place is no guarantee that energy savings will be achieved. Code-development organizations are responding to this barrier by simplifying new versions of the ASHRAE 90.1 standards and IECC. For example, the 2004 version of ASHRAE Standard 90.1 included updated HVAC equipment efficiency levels that reflect new federal manufacturing standards. In the residential sector, the 2006 IECC is about one-half the size of the 2003 edition. In addition, there is no longer a "window-to-wall ratio" requirement, a provision that many found overly complex. Instead, the envelope criteria (i.e., amount of insulation and window characteristics) are independent of the amount of glazing. Another change to both codes is that they now contain a simplified approach to characterizing climate zones, reducing the overall number from 19 to 8. Each zone is now a distinct geographic block aligned by political boundaries to facilitate code implementation and enforcement (ICC 2005).
 - *States Are Also Taking Steps to Reduce the Complexity of Their Codes.* They are finding that effective prescriptive codes—such as the model adopted by Oregon and Washington—are written in straightforward language that emphasizes simple measures with high energy savings potential. Code officials are also pursuing a range of best practices (see text box, *Best Practices for Energy*

Code Implementation) that minimize the additional learning and time requirements imposed on code officials.

- According to the National Science Foundation and the Lawrence Berkeley National Laboratory (LBNL), *Many States Do Not Possess the Necessary Resources to Monitor, Evaluate, and Enforce Their Energy Code*. Some states have less than one full-time-equivalent staff person dedicated to enforcement, and many states simply do not pursue monitoring and evaluation (DOE 2005). As a result, self-enforcement of building energy code provisions is the norm in many states. New York accomplishes this by requiring a licensed design professional to complete an official form attesting to code compliance.

Other states are using PBF funds to address the challenge of moving from the process of code adoption to widespread compliance. For example, California's Public Interest Energy Research (PIER)—funded by ratepayer dollars to conduct energy research and development for the state—works to identify candidate technologies and practices for improving the energy efficiency of new buildings in California. Currently, PIER is funding projects to support the development of California's 2008 Residential Building Energy Efficiency Standards (Eash 2005, CEC 2005a). In the face of resource shortages, other states rely on self-enforcement mechanisms such as home energy rating systems and the ENERGY STAR program.

Evaluation

State and municipal experience demonstrates that evaluating energy savings, conducting compliance surveys, and assessing the process by which program information is distributed are key elements of a successful building energy code. Evaluation of energy and peak demand savings data helps ensure requirements are followed and that stated goals are achieved. Information about the "co-benefits" of energy savings (e.g., financial savings and reductions in air pollution), implementation levels, and code awareness is used by code officials to evaluate progress, suggest strategies for improvement, and enhance overall program effectiveness.

Best Practices for Energy Code Implementation

States and municipalities have identified the following best practices for energy code implementation:

- Educate and train key audiences:
 - Build strong working relationships with local building officials, homebuilders, designers, building supply companies, and contractors for insulation, heating, and cooling equipment.
 - Hold regular education and training sessions before and after the effective date of the new energy code requirements. Maintain an ongoing relationship with homebuilders and building officials associations, even between code change cycles. This encourages both familiarity and trust and is an opportunity to share concerns.
- Provide the right resources, including:
 - An overview of energy code requirements, opportunities, and related costs and benefits.
 - Basic building science concepts. Practical compliance aids can range from laminated information cards for simple prescriptive methods to software packages for performance-based codes.
 - Information on how to inspect plans and site features for compliance.
 - Who to contact and resources for more information and technical assistance.
- Provide budget and staff for the program. Assign staff personnel with appropriate training and experience to support the code adoption and implementation processes. Provide this person with sufficient budgets to do the necessary homework, involve stakeholders, and support implementation.

Similarly, states are conducting studies of prospective energy savings from codes prior to adoption and implementation. Measuring the range of potential benefits—energy, economic, and environmental—can build the case for energy codes by assessing both positive and negative costs. If results show promise, studies of prospective benefits can also broaden stakeholder support for energy codes.

State and local officials are finding value from the following kinds of evaluation tools:

- *Energy Savings Evaluation.* Even though theoretical energy savings from building codes can be estimated with computer software, it is important to evaluate whether codes are actually saving energy and meeting goals. Information from energy savings evaluations can be used to determine if certain portions of the code perform better than others or if overall savings are meeting expectations. With this insight, states can focus their implementation and enforcement efforts on addressing priority concerns. For example, a 2002 study in Fort Collins, Colorado found that measured energy savings from a code change in 1996 were approximately half of pre-implementation estimates. By conducting a code evaluation, the city was able to identify problem areas and focus its resources accordingly (City of Fort Collins 2002).
- *Compliance Surveys.* These are used to determine whether buildings are being built in compliance with code. If they are not, additional enforcement and training initiatives may be needed. Another purpose of surveys is to assess the overall state of building technology and practice. Survey results might show, for example, that certain beyond-code energy features are gaining wide acceptance in the market due to improved cost-effectiveness.
- *Process Evaluation.* State programs that offer technical assistance and related services benefit from a process evaluation to assess and suggest improvements to these offerings. These evaluations look less at what is being built than at the ways information is delivered to key stakeholders such as builders and code officials. Improving service delivery can help improve code compliance and overall stakeholder acceptance of the code. Process evaluation is also used to determine the effectiveness of a state's enforcement efforts.

State Examples

The following states have implemented successful building codes programs using varying approaches.

California

California's Title 24 standards for residential and commercial buildings are among the most stringent and best-enforced energy codes in the United States. The building code provisions of Title 24 are notable for:

- *Stringency.* The Title 24 standards typically exceed IECC and ASHRAE efficiency levels.
- *Performance-Based Provisions.* California's building efficiency standards are organized into three basic components: mandatory features, prescriptive package requirements, and performance guidelines.
- *High Compliance Rates.* Field verification studies for Title 24-compliant buildings show that 70% of homes meet all code requirements.
- *Flexibility.* California is one of a few states that includes a performance-based approach that permits a wide variety of combinations of energy efficiency measures to meet code requirements.
- *Receiving Active Support.* The California Energy Commission (CEC) maintains an expert staff that manages the code development process and provides technical assistance in code interpretation and enforcement.
- *A Forward-Looking Orientation.* California periodically expands the scope and stringency of its energy codes to ensure that they capture available "potential savings" and works with its utilities on research and development to incorporate proven technologies.

California's new 2005 building efficiency standards are expected to yield \$43 billion in electricity and natural gas savings by 2011. Forecasts estimate that the standards will reduce annual energy demand by 180 MW, equivalent to the electricity requirements of 180,000 average-sized California homes (CEC 2003). The CO₂ savings in the residential sector alone is 49,000 tons per year, a figure equivalent to 9,600 passenger cars not driven for one year (USCTCG 2005).

Web site:

<http://www.energy.ca.gov/title24/>

Oregon and Washington

Compared to California, the states of Oregon and Washington take a simpler and more prescriptive approach to building energy efficiency. Their strategy is closely aligned to the Model Conservation Standards (MCS) developed in the Northwest region during the 1980s. The MCS were originally disseminated as voluntary standards under utility programs that offered incentives, education, and other support to builders. As builders came to accept the MCS, states in the region moved to incorporate them into building codes.

The simplicity and consistency across local jurisdictions of Oregon and Washington's prescriptive approach has achieved a high level of code compliance. A recent construction practice survey found that 94% of homes surveyed in Washington and 100% in Oregon met or exceeded code requirements for the building envelope (Ecotope 2001).

Residential energy codes in Oregon saved 857 million kilowatt-hours (kWh) and 40 million therms of natural gas in 2000 (Oregon Office of Energy 2001).

Web sites:

<http://egov.oregon.gov/ENERGY/CONS/Codes/codehm.shtml>

<http://www.energy.wsu.edu/code/default.cfm>

Texas

Texas is a "home rule" state that passed legislation in 2001 requiring local governments to follow a single statewide building energy code. It is also the first state to adopt an energy code primarily for Clean Air Act compliance reasons. After extensive stakeholder consultation, the state elected to adopt the IECC, including a solar heat gain standard for windows that results in significant cooling and peak load energy savings. The following are key features of the Texas code:

- The IECC's cooling energy savings are substantial. Electricity reductions from the solar heat gain standard alone will total 1.8 billion kWh over 20 years and avoid 1,220 MW of peak demand at the end of the 20-year period (Tribble et al. 2002).
- The Texas energy code is approved for 0.5 tons per day of NO_x emissions credits from EPA in the SIP for ozone pollution. This is the first time that an energy code has been adopted by a state specifically to improve air quality.
- Because Texas is a home rule state, it has limited ability to impose regulatory requirements on local jurisdictions. Successful implementation of a single statewide energy code is a political milestone.

Web site:

<http://www.trcc.state.tx.us>

Arizona

Arizona is another home rule state where energy codes are adopted and enforced at the local level. As such, several communities—including Pima County and the city of Tucson—have emerged as local leaders in building code adoption. Both jurisdictions now have codes based on the 2000 IECC. Another Arizona municipality, the city of Phoenix, recently conducted a comprehensive review and technical comparison of the national model building codes. After initiating a process to solicit stakeholder input, Phoenix pursued and adopted residential and commercial codes, making it the first city in the United States to adopt the IECC 2004 supplement for residential construction and the ASHRAE 90.1 2004 standard for commercial construction.

The successful experience of these municipalities has encouraged other local governments in Arizona to consider adopting an energy code. The Maricopa Association of Governments, a Council of Governments that serves as the regional agency for the Phoenix metropolitan area, is currently assessing the possibility of adopting building energy requirements for the more than 30 localities included within its jurisdiction (Panetti 2005).

Projected results from building codes programs include:

- By adopting the 2004 IECC, Phoenix is expected to reap an 18% reduction in residential energy consumption, a 21% reduction in electricity use, and a 10% in natural gas use.
- It is estimated that while a new home built to the IECC will cost an average of \$1,517 more than a home built without the code, the difference will be repaid to homebuyers in 3.9 years (based on simple payback). The life cycle cost savings associated with improved energy efficiency from adopting the IECC is \$11,228 per home (BCAP 2005b).

Web site:

<http://www.commerce.state.az.us/energy/state%20energy%20code.asp>

What States Can Do

States with energy codes can consider updates and improvements to the implementation process. States with no energy code in place can examine the costs and benefits of implementing a code and consider initiating a code adoption process.

Action Steps

States that already have an energy code can:

- Implement a rigorous enforcement program that ensures local building code departments have proper training and resources, including adequate staff coverage.
- Review the version of the document currently in force. If it is more than five years old, consider an updated version. The latest available IECC code version is the 2006 version, which was released in October 2005. The most recent ASHRAE Standard 90.1 is the 2004 version.
- Conduct analysis on the effect of potential code updates on energy and cost savings for building owners, on the effect on energy generation and distribution, and on air pollutant and greenhouse gas emissions levels. Balance these benefits against any added construction costs.
- Initiate a stakeholder process to review the data, obtain participant input, and decide whether to adopt a new code.
- If a new version of the energy code is adopted, initiate administrative and educational processes. Implementation tools and other resources are available at no charge from DOE.
- If a state-specific energy code training program exists, review it and consider an update that describes new codes not currently covered.

States that are considering adopting an energy code can:

- Review all available model codes and standards and learn about other states' experiences. Conduct research and analysis to determine which codes best match the needs of the area under consideration.
- Establish a baseline building prototype against which to assess the benefits of an energy code. This may require a field survey of homebuilders, suppliers, and contractors, including onsite inspections and interviews.
- Conduct an analysis of the effect of the new code on energy and cost savings for building owners, power system reliability, and reduced air pollutant and greenhouse gas emissions. Balance these benefits against any added construction codes.
- Initiate a stakeholder process to review the data, obtain stakeholder input, and decide whether to adopt the energy code under consideration.
- After a decision to adopt an energy code, initiate administrative and educational processes, as appropriate.
- Develop a code implementation process that includes training and technical assistance. Reach out to affected industries and audiences across the state.

Information Resources

Information About Individual State Codes

Title/Description/Contact Information	URL Address
BCAP. A nonprofit organization, BCAP is dedicated to helping states adopt and implement up-to-date building energy codes. The BCAP Web site includes maps, data on code status for all states, and information on training opportunities.	http://www.bcap-energy.org
Building Energy Codes Program Web Site: Case Study: Massachusetts Commercial Energy Code. This Web site includes highlights of the Massachusetts Commercial Energy Code and details of the collaborative code adoption process along with projected energy and cost savings and pollution reduction.	http://www.energycodes.gov/implement/case_studies/massachusetts.stm
Building Energy Codes Program Web Site: Case Study: New York Energy Conservation Construction Code. This Web site includes an overview of the New York Energy Conservation Construction Code and the code adoption process, and also details some of the reasons for the code's success.	http://www.energycodes.gov/implement/case_studies/new_york.stm
California: CEC. Phone: 916-654-5106 or 800-772-3300 (toll free in California). E-mail: title24@energy.state.ca.us .	http://www.energy.ca.gov/title24
DOE Status of State Energy Codes. This Web site provides data for each state on state contacts, current code status, code history, and construction data.	http://www.energycodes.gov/implement/state_codes/index.stm
Florida: Department of Community Affairs. Codes & Standards Office 2555 Shumard Oaks Blvd. Tallahassee, FL 32399-2100 Phone: 850-487-1824.	http://www.floridabuilding.org
Minnesota: Building Codes and Standards Division 408 Metro Square Building 121 7th Place East St. Paul, MN 55101 Phone: 651-296-4639.	http://www.state.mn.us/cgi-bin/portal/mn/jsp/home.do?agency=BCSD or http://www.state.mn.us/cgi-bin/portal/mn/jsp/content.do?subchannel=-536886620&id=-536886617&agency=BCSD
Oregon Office of Energy 625 Marion St. NE Salem, OR 97301-3737 Phone: 503-378-4040 or 800-221-8035 / Fax: 503-373-7806 E-mail: energyweb.incoming@state.or.us .	http://egov.oregon.gov/ENERGY/CONS/Codes/codehm.shtml
Texas A&M Energy Systems Laboratory (ESL) ESL Senate Bill 5 Program Room # 053 Wisenbaker Engineering Research Center Bizzell Street Texas A&M University College Station, TX 77843-3581 Phone: 979-862-2804 / Fax: 979-862-2457.	http://165.91.209.42/sb5/workshops/training.htm
Washington State Energy Extension Service 925 Plum Street SE Bldg No 4 Box 43165 Olympia, WA 98504-3165 Phone: 360-956-2000 / Fax: 360-956-2217.	http://www.energy.wsu.edu/code/default.cfm

Other Resources for Building Code Information

Title/Description	URL Address
ASHRAE. ASHRAE provides technical standards and other technical information.	http://www.ashrae.org/
BCAP. A nonprofit organization, BCAP is dedicated to helping states adopt and implement up-to-date building energy codes.	http://www.bcap-energy.org/
Codes and Standards: MEC. The MEC is published and maintained by the ICC. The 1998 IECC is the successor to the 1995 MEC.	http://www.energycodes.gov/implement/pdfs/modelcode.pdf
DOE BECP. Operated by PNNL, BECP provides compliance tools, technical assistance, and other code information and support.	http://www.energycodes.gov
ICC. The ICC provides code documents, technical assistance, training, and other services.	http://www.iccsafe.org
New Buildings Institute (NBI). A nonprofit organization, NBI develops leading-edge commercial building standards and related research and technical information.	http://www.newbuildings.org/
RESNET. RESNET accredits home energy rating organizations, and provides a variety of technical information on home energy ratings and home energy performance.	http://www.natresnet.org/

Compliance and Analytical Tools

Title/Description	URL Address
DOE Building Energy Tools Directory. This is the DOE directory of building energy analysis tools.	http://www.eere.energy.gov/buildings/tools_directory/
DOE COMcheck-EZ and REScheck Software. Provided through the DOE codes program, these simple programs offer an easy way to check whether a wide variety of building designs meet energy code requirements.	http://www.energycodes.gov/compliance_tools.stm
DOE EnergyPlus. This public-domain software provides accurate building energy simulation capabilities.	http://www.eere.energy.gov/buildings/energyplus/
ENERGY STAR Portfolio Manager. This tool allows users to track energy use of a portfolio of buildings online. It includes functions for benchmarking, managing a single building or group of buildings, assessing investment priorities, and verifying building performance.	http://www.energystar.gov/index.cfm?c=evaluate_performance.bus_portfoliomanager
ENERGY STAR Target Finder. This tool rates the energy performance of a building design using information about energy use per-square-foot derived from building design simulation tools. EPA's energy performance rating system uses a 1 to 100 scale, where an ENERGY STAR target rating is 75 or higher.	http://www.energystar.gov/index.cfm?c=target_finder.bus_target_finder

Examples of Code Language

State	Title/Description	URL Address
Arizona	Arizona State Energy Code; Advisory Commission (voluntary).	http://www.azleg.state.az.us/ars/41/01511.htm
	Proposed Amendments to IECC.	http://phoenix.gov/DEVSERV/ieccamd.pdf
	Sustainable Energy Standard for the IECC, 2000 edition, regionally specific for the Tucson Metropolitan Area.	http://www.ci.tucson.az.us/dsd/Codes__Ordinances/Building_Codes/2000IECCSES_sustainable_energy.pdf
California	California State Legislature, AB 970, Section 25553.	http://www.leginfo.ca.gov/pub/99-00/bill/asm/ab_0951-1000/ab_970_bill_20000907_chaptered.html
	2001 Energy Efficiency Standards for Residential and Nonresidential Buildings.	http://www.energy.ca.gov/title24/2001standards/2001-10-04_400-01-024.PDF
Oregon	Oregon Revised Statutes, 455.525.	http://www.leg.state.or.us/ors/455.html
	Oregon Department of Energy, Energy Code Publications and Software.	http://egov.oregon.gov/ENERGY/CONS/Codes/cdpub.shtml
Texas	Texas Residential Building Guide to Energy Code Compliance.	http://165.91.209.42/sb5/documents/ResGuideRev104.pdf
	Texas State Legislature, SB 5—Legislative Session 77(R), Chapter 388.	http://www.capitol.state.tx.us/statutes/docs/HS/content/htm/hs.005.00.000388.00.htm
Washington	Washington State Legislature, WSR 05-01-013. Enter "05-01-013 " in <i>Search Bills, RCW, WAC, and State Register</i> box and check "State Register 2005."	http://search.leg.wa.gov/pub/textsearch/default.asp
	Washington State Building Code Council, State Building Codes.	http://www.sbcc.wa.gov

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CEC. 2005a. 2004 Annual Review of the PIER Program, Volume 2: Residential and Commercial Buildings End-Use Efficiency Project Summaries. CEC-500-2005-055-V2. March. CEC.	http://www.energy.ca.gov/2005publications/CEC-500-2005-055/CEC-500-2005-055-V2.PDF
CEC. 2005b. 2005 Building Energy Efficiency Standards for Residential and Non-Residential Buildings. P400-03-001F-M. October 1. CEC.	http://www.energy.ca.gov/title24/2005standards/2004-12-13_400-03-001FM.PDF
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DOE. 2005. State Energy Alternatives: Energy Codes and Standards. Energy Efficiency and Renewable Energy Web site. U.S. Department of Energy, Washington, D.C.	http://www.eere.energy.gov/states/alternatives/codes_standards.cfm
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ICC. 2005. International Code Council Web Site: News.	http://www.iccsafe.org
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4.4 State Appliance Efficiency Standards

Policy Description and Objective

Summary

State appliance efficiency standards establish minimum energy efficiency levels for appliances and other energy-consuming products. These standards typically prohibit the sale of less efficient models within a state. Many states are implementing appliance and equipment efficiency standards, where cost-effective, for products that are not already covered by the federal government.¹³ States are finding that appliance standards offer a cost-effective strategy for improving energy efficiency and lowering energy costs for businesses and consumers.

As of November 2005, 10 states (Arizona, California, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington) have adopted standards for 36 types of appliances. Four states (Maine, New Hampshire, Pennsylvania, and Vermont) are considering adopting standards.

Appliance efficiency standards have been an effective tool for improving energy efficiency. At the federal level, the U.S. Department of Energy (DOE) has been responsible for setting minimum appliance standards and test procedures for an array of residential and commercial appliances and equipment since 1987. As of 2000, federal appliance efficiency standards had reduced U.S. electricity use by 2.5% and carbon emissions by nearly 2%. By 2020, the benefits from existing standards are expected to more than triple as the stock of appliances and equipment is replaced by more efficient models (Geller et al. 2001). The appliance standards for 16 products established by the Energy Policy Act of

Appliance standards save energy and generate net benefits for homes, businesses, and industry by reducing the energy cost needed to operate equipment and appliances.

2005 (EPAAct 2005) are expected to yield an additional 2% savings in total electricity use (ACEEE 2005a).

Efficiency standards can play a significant role in helping states meet energy savings goals. In New England, for example, a package of state standards is expected to reduce load growth by 14% from 2008 to 2013 and cut summer peak demand growth by 33% (Optimal Energy 2004).

States are also finding that appliance standards have low implementation costs because the existing standards of states like California can be leveraged.

Objective

The key objectives of appliance efficiency standards are to:

- Raise the efficiency of a range of residential, commercial, and industrial energy-consuming products, where cost-effective.
- Overcome market barriers, such as split incentives between homebuilders and homebuyers and between landlords and tenants, and panic-purchase situations where appliances break and must be replaced on an emergency basis. In a panic purchase, customers usually don't have the time to consider a range of models, features, and efficiency levels.
- Ensure energy use reductions to prevent pollution and greenhouse emissions, improve electric system reliability, and reduce consumer energy bills.

¹³ Under certain conditions, states can exceed a federal standard for a federally covered product; overall, however, federal law is preemptive. For example, in the case of building codes, a state can create a building code compliance package in which a furnace is at a higher efficiency than the federal standard. However, the state must also provide a compliance path under which the higher-efficiency furnace is not required. Thus, the option to exceed federal standards is indirect and is typically only possible in the case of building codes. In addition, states cannot ban lower efficiency products.

Benefits

In addition to saving energy, appliance and equipment standards help reduce pollutant emissions, improve electric system reliability, and save consumers and business owners significant amounts of money over the life of the equipment. As of 2000, federal standards had reduced U.S. electricity use by 2.5% and U.S. carbon emissions from fossil fuel use by nearly 2%. Total electricity savings from already adopted federal standards are projected to reach 341 billion kilowatt-hours (kWh) per year or 7.8% of the projected total U.S. electricity use in 2020 (Geller et al. 2001). The appliance standards in the EPAAct of 2005 are expected to result in additional savings of 90 billion kWh or 2% of projected total U.S. electricity use in 2020 (ACEEE 2005a). The potential savings from five products that are not currently covered by

federal law or designated under the EPAAct for standard setting by DOE are estimated to be 24.4 terawatt-hours (TWh)¹⁴ of electricity and about 4 quads¹⁵ of primary energy¹⁶ in 2030 if implemented nationally, generating \$14.6 billion in net savings for consumers and business owners for equipment purchased through 2030. These standards are also very cost-effective, with a high benefit-cost ratio, as illustrated in Table 4.4.1 (Nadel et al. 2005).

The direct economic and environmental benefits of state standards are also substantial. One study of 19 California product standards projects savings to California consumers and businesses of more than \$3 billion by 2020 and estimates that these standards will reduce the need for three new power plants (ASAP 2004).

Table 4.4.1: Estimated Energy Savings and Economics of Appliance Standards Not Covered by Federal Law

Products	Effective Date (year)	National Energy Savings in 2020 (TWh)	(tril. Btu)	National Energy Savings in 2030 (TWh)	(tril. Btu)	Cumulative Savings for Products Purchased thru 2030 (quads)	Net Present Value ^a for Purchase thru 2030 (\$ billion)	Benefit Cost Ratio
Digital cable and satellite boxes	2007	1.4	14	1.4	14	0.4	1.2	4.1
Digital television adapters	2007	0.3	3	0.0	0	0.2	1.1	7.4
Medium-voltage dry-type transformers	2007	2.7	28	4.7	47	0.6	2.4	5.5
Metal halide lamp fixtures	2008	9.0	93	14.4	144	1.9	7.3	10.8
Reflector lamps	2007	3.9	40	3.9	39	0.9	2.6	4.1
Total		17.3	178.0	24.4	244.0	4.0	14.6	

^a Net Present Value is the value of energy savings due to standards minus the additional cost of more efficient products, expressed in current dollars. A 5% real discount rate was used for these calculations.

Source: Nadel et al. 2005.

¹⁴ One TWh is a billion kWh.

¹⁵ A quad is a quadrillion Btus. By way of comparison, the entire United States currently uses a total of about 100 quads annually in all sectors of the economy.

¹⁶ Primary energy includes the energy content of the fuel burned at the power plant and not just the energy content of electricity as it enters a home or factory. Typically, about three units of energy are consumed at the power plant in order to deliver one unit of energy to a home. The remaining energy is lost as waste heat from the power plant and along the transmission and distribution system.

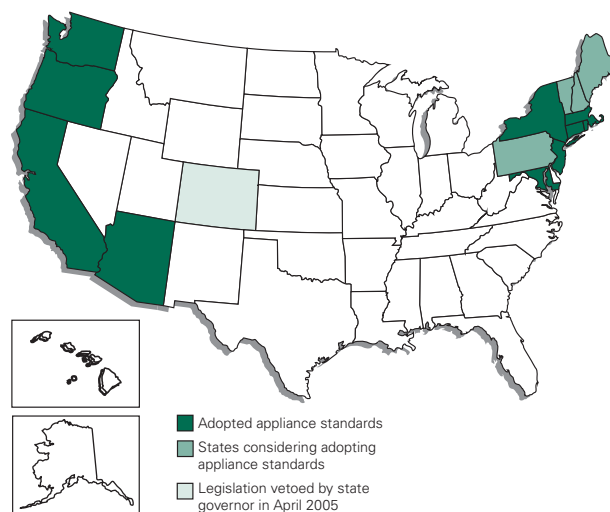
States with Appliance Efficiency Standards

A number of states have either implemented appliance standards or are considering implementing them, as shown in Figure 4.4.1. California's appliance standards program dates to the 1970s, when the state began to pursue standards before the enactment of federal legislation. When the federal government opted not to issue standards under its legislative mandate in 1982, other states joined California and developed state standards. These state initiatives helped create the consensus for new federal legislation in 1987 (the National Appliance Energy Conservation Act or NAECA) and the Energy Policy Acts of 1992 and 2005. While the NAECA preempted state action on federally covered consumer products (with limited exceptions as discussed later), California has continued to develop efficiency standards for other products and technologies.

California's appliance efficiency standards are estimated to have saved about 2,000 megawatts (MW) (about 5%) of peak electricity load in 2001. As shown in Figure 4.4.2, this represents 20% of California's total peak load savings from all energy efficiency programs. The standards cover 30 products (plus three additional products for which standards or revised standards are pending) and have saved consumers and businesses millions of dollars (Delaski 2005).

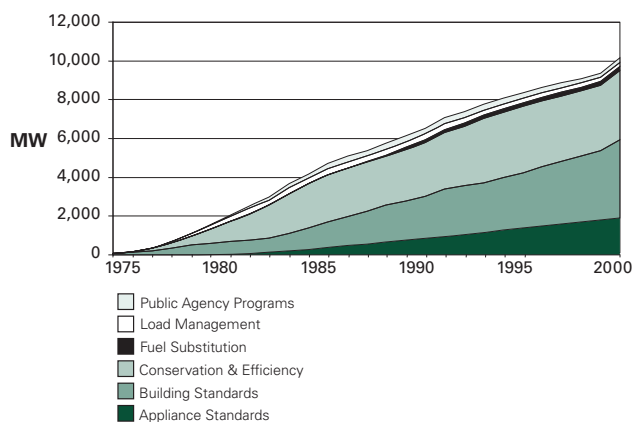
Additional states have recently enacted efficiency standards. These include Arizona, Connecticut, Maryland, Massachusetts, New Jersey, New York, Oregon, Rhode Island, and Washington. Table 4.4.2 lists adopted and pending efficiency standards by state. In setting equivalent or stronger standards at the national level for the shaded products in Table 4.4.2, the EPAAct of 2005 preempts additional states from setting standards for these particular products. States that enacted standards prior to EPAAct 2005 will enforce their state standard up until the equivalent or stronger federal requirements go into effect.

Figure 4.4.1: States with or Considering Appliance Standards



Source: Compiled by Stratus Consulting Inc.

Figure 4.4.2: Load Savings from Appliance Efficiency Standards As Compared to Other Energy Efficiency Programs in California



Source: Motamedi 2005 (based on CEC data).

Table 4.4.2: States with Adopted or Pending Appliance Efficiency Standards

Products	AZ	CA	CT	MA	MD	NJ	NY	OR	RI	WA
Boilers and central furnaces not covered by federal standards		X		X						
Ceiling fans and ceiling fan lights ^a					X		X			
Commercial clothes washers	X	X	X		X	X		X	X	X
Commercial hot food holding cabinets		X								
Commercial ice-makers ^b	X	X					X	X	X	X
Commercial reach-in refrigerators and freezers ^b	X	X	X		X	X	X	X	X	X
Commercial unit heaters	X	X	X		X	X	X	X	X	X
Computer room air conditioners		X								
Consumer audio and video equipment		X					X			
Digital television adaptors		X					X			X
Duct furnaces		X								
Evaporative coolers		X								
Exit signs	X	X	X		X	X	X	X	X	X
External power supplies ^b	X	X		X			X	X	X	X
Freezers (residential, 30 to 39 cubic feet)		X								
General service incandescent lamps not federally regulated		XO								
High-intensity discharge lamp ballasts									X	
Hot tubs (portable electric spas)		X								
Incandescent reflector lamps not federally regulated		O		X			X	X		X
Large commercial packaged air-conditioners	X	X	X		X	X	X		X	
Low-voltage dry-type distribution transformers	X	X	X		X	X		X	X	X
Medium-voltage dry-type distribution transformers				X						
Metal halide lamp fixtures	X	XO		X			X	X	X	X
Pool heaters not covered by federal standards		X								
Pool pumps		X								
Pre-rinse spray valves	X	X					X	X	X	X
Refrigerated beverage vending machines ^b		X								
Small water heaters not covered by federal standards		X								
Torchieres	X	X	X		X	X	X	X	X	X
Traffic signal modules-pedestrian	X	X				X	X	X		
Traffic signal modules-vehicular	X	X	X		X	X	X	X	X	X
Under-cabinet light fixture ballasts		X								
Walk-in refrigerators and freezers		X								
Water dispensers		X								
Water and ground water-source heat pumps		X								
Wine chillers		X								

Key: X=Adopted, XO=Standard adopted and a revised standard is pending, O=Pending.

Note: Products where rows are shaded are state standards preempted by the standards established by EPCA 2005. EPCA 2005 also establishes federal efficiency standards for compact fluorescent lamps, residential dehumidifiers, traffic lights, and fluorescent lamp ballasts.

^a EPCA 2005 sets standards for residential ceiling fan light kits.

^b The specific standards for these products were not established by the legislation; the legislation requires DOE to investigate whether standards are technically feasible and economically justified and to set standards where these criteria are met.

Sources: Compiled from Delaski 2005, Nadel et al. 2005, State of Washington 2005, and other sources listed under Examples of Legislation on page 4-66.

Washington's appliance efficiency standards are expected to result in significant electricity, natural gas, and water savings. An analysis by the state's Department of Community, Trade and Economic Development's Energy Policy Division estimates that the standards on these 13 products will save 136 million kWh of electricity, 2 million therms of natural gas, and 406 million gallons of water in the first year the standards are enacted. Savings grow significantly over time as old products are retired and new products subject to these standards are installed. This report also estimates that by 2020, assuming the standards are in place through that period, natural gas savings would amount to 3% of the commercial sector's consumption and total electricity savings could power 90,000 homes. By 2014, annual water savings from these standards could total up to 2 billion gallons. Standards on pre-rinse spray valves could save 51,205 megawatt-hours (MWh) of electricity, 6,745 therms of natural gas, and 1,785 million gallons of water per year by 2020 (State of Washington 2005).

Designing an Effective Appliance Standards Policy

States have substantial experience with appliance efficiency standards. Key issues they have addressed include: identifying participants, design issues, and linkages with federal and state policies.

Participants

- *State Legislatures.* Establishing efficiency standards in a state typically requires enabling legislation. However, once legislation is enacted, it may allow an executive agency to set further standards administratively. Because legislation has been developed for many standards, state legislatures typically do not need to conduct original research on definitions. Similarly, because several states have established standards for administration procedures, these implementation processes can also be largely replicated from other states' experiences.
- *State Energy Offices.* State energy offices, which typically administer the federal state energy program funds, have generally acted as the administrative lead for standards implementation.
- *Product Manufacturers.* Companies that make affected products clearly have a stake in standards development. Proactive consultations with manufacturers can increase the speed and effectiveness of the development and implementation process. Their expertise can help refine efficiency levels and labeling and certification procedures.
- *Product Distributors, Installers, and Retailers.* Wholesale distributors, installation contractors, and retail vendors are key players in that they must know the technical requirements and labeling and certification rules to be able to participate effectively in standards implementation and enforcement.
- *Customers.* It is important to consider the people who use the affected products during the standard development and implementation processes. Consideration includes assessing benefits and costs to consumers and impacts on product features or market choices.
- *Utilities.* Utilities may provide technical assistance for developing standards and support for implementation. Their relationships with customers and trade allies can also be helpful in educating markets about the effects of new standards. Utilities that operate voluntary efficiency programs may want to coordinate their incentive and education programs, gearing voluntary incentive targets to the standards.
- *Public Interest Organizations.* Groups representing consumers, environmental interests, and other public interests can offer technical expertise and important public perspectives in developing and implementing standards as baselines.

Key Design Issues

- *Defining the Covered Products and Their Energy Efficiency, Applicability, and Cost-Effectiveness.* States have adopted appliance standards that

cover from five to more than 30 products. Some products may not be appropriate candidates for standards if, for example, they have recently been covered by federal law, or they are not appropriate for the state's climate or markets. States target certain products for standards based on their total energy savings potential, technical feasibility, and economic attractiveness. Because technologies suitable for appliance standards are typically already being used in well-known, consistent applications, estimating their energy savings has been relatively straightforward.

- *Assessing Overall Benefits and Costs.* In addition to the economic assessment of individual technologies, states have conducted overall assessments of benefits and costs. Benefits can include energy savings, energy bill reductions, electric reliability benefits, reduction in future energy market prices, and air pollutant and greenhouse gas emission prevention. Costs can include product buyer costs, product manufacturer costs, and program administration costs.
- *Availability of Test Methods.* Test methods are necessary to set efficiency levels for the state appliance standards. Test methods may have been established by federal agencies such as DOE or the U.S. Environmental Protection Agency (EPA), by other states that have already set standards, or by industry associations representing companies that make the products of interest.
- *Defining Certification and Labeling Requirements.* Like test methods, product certification and labeling procedures may have already been established by federal or state agencies or by industry associations. In some cases, it may be necessary for appliance standards regulations to define a labeling or certification method beyond those already established. On the other hand, and in rare instances, technical or market issues may warrant certification or labeling exemptions for certain products. For example, if a standard calls for a simple, prescriptive design change, that feature may be so visible on the product that certification and labeling may not be needed.
- *Establishing Inspection and Enforcement Procedures.* Inspection and enforcement of appliance standards

regulations has typically involved self-policing. Industry competition is usually such that competitive manufacturers report violations. While states may want to reserve the legal right to inspect individual products or installations, it is rare that federal or state agencies have had to institute regular inspection or sustained enforcement actions.

Interaction with Federal Policies

Federal laws, such as NAECA, EAct 1992, and EAct 2005, have established appliance efficiency standards for more than 40 products (see Table 4.4.3 on page 4-60). DOE is currently conducting rulemakings for three of the products listed in Table 4.4.3: commercial packaged air conditioners, residential furnaces and boilers, and dry-type distribution transformers. EAct 2005 directs DOE to set standards for several additional products, including: vending machines, dehumidifiers, external power supplies, commercial refrigeration, and icemakers. States can actively promote efficient models of these products by increasing consumer awareness and developing other programs.

States are preempted from setting their own standards for the products covered by federal standards. State efficiency standards that were established before a product was covered under NAECA are preempted as of the effective date of the federal standard (i.e., the date that manufacturers must comply with that standard). Nevertheless, some states are enacting standards for products that are not yet covered by federal law, for which DOE rulemakings will take place (as directed by EAct), and/or that are being considered for coverage under NAECA, expecting to gain several years of savings in the interim. States can apply for waivers of preemption for products that are covered by federal law. If, for example, they face special conditions, states can cite such circumstances as the basis for a waiver. In September 2005, California petitioned DOE for a preemption waiver to implement a state water efficiency standard for clothes washers. Legislation pending in Massachusetts would require state officials there to seek a waiver from federal preemption allowing the state to implement tougher home furnace and boiler standards.

Table 4.4.3: Products Subject to Existing Federal Appliance Efficiency Standards

Products Included in NAECA 1987	
<ul style="list-style-type: none"> Central air conditioners and heat pumps Clothes washers Clothes dryers Direct-fired space heaters Dishwashers Fluorescent lamp ballasts Freezers 	<ul style="list-style-type: none"> Furnaces and boilers Pool heaters Ranges and ovens Refrigerator-freezers Room air conditioners Televisions^a Water heaters
Products Added by EPAAct 1992	
<ul style="list-style-type: none"> Commercial furnaces and boilers Commercial packaged air conditioners and heat pumps Commercial water heaters Distribution transformers^a Electric motors (1 to 200 horsepower) Faucets and aerators 	<ul style="list-style-type: none"> Fluorescent lamps High-intensity discharge lamps^a Incandescent reflector lamps Small electric motors (< 1 horsepower)^a Showerheads Toilets
Products Added by EPAAct 2005	
<ul style="list-style-type: none"> Automatic commercial ice makers^a Ceiling fans and ceiling light kits Commercial clothes washers Commercial refrigerators and freezers^a Commercial pre-rinse spray valves Compact fluorescent lamps Dehumidifiers External power supplies^a Fluorescent lamp ballasts 	<ul style="list-style-type: none"> High-intensity discharge lamp ballasts Illuminated exit signs Large packaged air-conditioners (> 20 tons) Low-voltage dry-type transformers Torchieres Traffic signals (vehicular) Traffic lights Unit heaters Vending machines^a

^a The specific standards for these products were not established by the legislation; the legislation requires DOE to investigate whether standards are technically feasible and economically justified and to set standards where these criteria are met.

Sources: Nadel and Pye 1996, ACEEE 2005b.

Interaction with State Policies

Appliance efficiency standards interact with other state policies in several ways. Standards set a minimum compliance level, while voluntary efficiency programs help consumers identify products that achieve a high level of energy efficiency. For example, ENERGY STAR specifications for products are significantly higher than minimum standards. The ENERGY STAR program expands the use of highly efficient products by homes and businesses, while standards are used to prohibit the sale of products below an acceptable level. Additionally, standards can interact with building codes by preempting building code provisions related to those equipment types, ensuring that building codes incorporate higher efficiency appliances. In some cases, building codes can be modified to include tradeoffs for equipment that exceed minimum standards or code requirements.

Program Implementation and Evaluation

Many states have learned that they do not need to start from scratch when developing and implementing appliance efficiency standards; in many cases, they can refer to the work already conducted by states with established appliance efficiency standards. For example, states have made minor adaptations to existing legislation based on the product lists and analyses conducted by other states. States have also consulted national and regional organizations with expertise and technical support capability. (For additional information about states' activities, see the *State Examples* section on page 4-62.)

While a state agency can initiate an inquiry into efficiency standards, legislation is typically needed to enable executive agencies to regulate in this area. Once legislatively authorized, states have followed these steps toward successful implementation of appliance efficiency standards:

- **Establish a Stakeholder Process.** Notify affected manufacturers, consumers, utilities, state agencies, and public interest organizations about the

initiative. Develop information materials and hold workshops to inform stakeholders and solicit feedback.

- *Define Covered Products.* Develop a specific list of product and equipment types to be covered by the program. States have obtained lists of eligible products from other states that have recently enacted standards and from national organizations.
- *Conduct Benefit-Cost Analysis and Related Studies.* (See design issues described on page 4–58.)
- *Conduct Rulemaking.* The rule typically defines covered products, effective dates, efficiency standards, test methods, certification and labeling procedures, inspection and enforcement procedures, penalties for noncompliance, procedures for appeals, waivers and other exceptions, and contact information for the agencies involved. A rulemaking also provides formal notice, review, and comment procedures. When enabling legislation authorizes the executive branch to add new products or update standards on covered products, the regulatory process may be reopened after a few years.
- *Monitor, Review, and Modify the Program as Needed.* Based on stakeholder response and market trends, some states have made specific program modifications, including revisions to covered products, efficiency levels, and effective dates, as well as process improvements such as more frequent stakeholder input cycles and more transparent public information processes.

Typical implementation issues include:

- *Effective Dates.* A single date is typically established after which noncomplying products cannot be sold or installed in the state. In some cases, where warranted by product-specific considerations, extra time is allowed for manufacturers or retailers to prepare for the new standards.
- *Test Methods.* A specific method must be defined for testing the efficiency of a given product type. DOE, industry associations, and/or technical societies such as the American Society for Testing Materials (ASTM), American Society of Mechanical Engineers (ASME), Illuminating Society of North America (IESNA), or American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) are typical sources of test methods.
- *Product Certification.* The federal standards program is essentially self-certifying; that is, manufacturers use approved test procedures to attest that affected products comply with standards. Some states, notably California, maintain databases of covered products to identify which models are in compliance with their state standards.
- *Labeling Requirements.* To date, state standards programs have relied primarily on national labeling and other information programs to address the need to label covered products. For example, federal law requires the Federal Trade Commission to operate an appliance labeling program for defined product types, and the DOE/EPA ENERGY STAR programs include certain labeling guidelines. In some cases, industry associations set labeling guidelines for certain products. Labeling issues vary by product type and are resolved on a case-by-case basis.
- *Enforcement.* The federal standards program and the California program are largely self-policing. Manufacturers are expected to provide complying products and competitive forces are expected to prevent violations. Enforcement actions typically depend on market participants to bring violation

Best Practices for Standards Design and Implementation

- *Learn from others.* There are many lessons to be learned from states that have adopted appliance standards.
- *Consult with stakeholders.* Identify key groups early, including product manufacturers, affected retailers and customer groups, advocates, and utilities. Keep stakeholders informed and seek their input regularly.
- *Conduct a benefit-cost analysis* of the proposed standards.
- *Address key issues* such as: covered products, efficiency levels, effective dates, test methods, product certification, labeling requirements, and enforcement.
- *Review and adjust covered product lists* to be sure they are technically and legally up to date.

claims. In the two long-running programs—the federal and California programs—enforcement actions have been rare.

Evaluation

Appliance efficiency standards programs have achieved defined results with minimal expenditure of public funds. Evaluating the benefits and costs of the standards is important during the standards-setting process. Once enacted, little field evaluation is performed.

Depending on the state enabling law, the implementing agency may be empowered to increase standards for affected products and/or to set standards for other product types. These actions are likely to involve detailed technical and economic evaluation. Improvements in the standards-setting process itself can also be considered at such times.

Once a state has operated a standards program for several years, it is helpful to conduct a program review to improve procedures and implement other enhancements.

A key issue for assessment is degradation of savings. Standards are established for a typical assumed application; over time the use of the product or device may change so that the original intent of the standard is not being served, or technology may change to the point that the device is used differently. Consequently, it can be valuable to review the markets and applications in which standards-covered devices are used, to ensure that the standards are having the intended effect. If the market or application context changes sufficiently for a product, the applicable standard may need to be reevaluated.

Other opportunities for evaluation include assessments of energy, demand, emissions, and other impacts over time, both for evaluating effectiveness and for quantifying emissions impacts for air quality or climate policy purposes. A periodic process evaluation of the standards program can also be helpful to ensure that stakeholder participation is appropriate, technical methods are up-to-date and effective, and rulemaking procedures are as transparent and non-bureaucratic as possible.

Best Practices for Standards Evaluation

- Conduct technical and economic evaluation of opportunities to increase appliance standards and/or set standards for new products.
- Review markets and product applications periodically (e.g., every three to five years) to determine whether new or adjusted regulations are needed to avoid degradation of savings.

State Examples

California

California was the first state to initiate an appliance efficiency standards program (in 1977) and maintains the most active and well-funded standards program of any state. California law now covers 30 products; new or upgraded standards are under consideration for three products. Most state standards programs in recent years have used California's covered products, or a subset of these products, and its technical procedures as the basis for their efforts. The California Energy Commission (CEC) operates the standards programs for the state. It develops technical and economic assessments of products recommended for rulemakings, develops draft regulations, holds public participation processes, issues final rules, monitors compliance, and maintains a database of covered products.

California's standards program has contributed to substantial improvements in energy efficiency. The standards in place in the state are currently reducing peak electric demand by about 2,000 MW or about 5% of peak load. These savings account for about 20% of California's total peak demand reductions from all efficiency programs over the past 20 years. By 2010, the 2002 California appliance standards could reduce natural gas consumption by 20.9 billion cubic feet and electricity use by 2,485 million kWh. This translates into a cumulative net savings of \$1.9 billion. The savings could increase significantly by 2020: natural gas consumption would be reduced by 41 billion cubic feet and electricity consumption would be reduced by 7.1 billion kWh, resulting in a cumulative net savings of \$4.3 billion (ACEEE 2000).

California must receive a federal waiver to enact its proposed state standards for residential water heaters and clothes washers, since they would exceed the existing federal standards. California has published standards for NAECA-covered and non-NAECA covered products. However, the CEC appears unlikely to request the waiver for water heaters so the proposed standards are not likely to save energy beyond NAECA levels. On clothes washers, California established a water factor in their standard. This requires a waiver, which the CEC filed on September 13, 2005. If the waiver is granted to CEC, the clothes washers standards could save 17 billion cubic feet of natural gas, 1.1 billion kWh of electricity, and more than \$1.9 billion in cumulative net savings by 2020. Water heater standards could save 19 billion cubic feet of natural gas, 469 million kWh in electricity, and \$761 million in cumulative net savings.

Web sites:

<http://www.energy.ca.gov/efficiency/appliances/index.html>

<http://www.energy.ca.gov/appliances/documents/index.html> (contains documents detailing California's technical and economic analysis process)

<http://www.energy.ca.gov/appliances/appliance/index.html>

http://www.energy.ca.gov/appliances/appliance/excel_based_files/ (contains California appliance data)

Connecticut

Connecticut enacted efficiency standards legislation in 2004 through Senate Bill 145 (S.B.145). This bill covers the following products: torchiere lighting fixtures, building transformers, commercial refrigerators and freezers, traffic signals, exit signs, large packaged air conditioning equipment, unit heaters, and commercial clothes washers. The Connecticut standards are expected to save residents and businesses more than \$380 million in energy costs by 2020, conserve over 430 gigawatt-hours (GWh) of electricity, reduce summer peak electricity demand by over 125 MW, and avoid the emissions of about 65,000 metric tons of carbon (NEEP 2004).

Web site:

http://search.cga.state.ct.us/dtsearch_lpa.html

New Jersey

In 2005, New Jersey enacted energy efficiency standards for nine products. Very similar to the Connecticut bill, the new law sets standards for commercial clothes washers, commercial freezers, illuminated exit signs, very large air-cooled commercial air conditioning equipment, low-voltage dry-type distribution transformers, torchiere lighting fixtures, traffic signal modules, and unit heaters.

Analysis of the bill indicates that New Jersey customers will save hundreds of millions of dollars in energy costs over the next 20 years, while significantly reducing emissions of sulfur dioxide (SO₂) and smog-forming nitrogen oxide (NO_x). The new standards are estimated to reduce New Jersey's annual carbon dioxide (CO₂) emissions by almost 175,000 metric tons, equivalent to removing almost 145,000 cars from the road.

Web site:

<http://www.bpu.state.nj.us/home/home.shtml>

New York

Signed on July 29, 2005, the *Appliance and Equipment Energy Efficiency Standards Act of 2005* establishes state energy efficiency standards for 14 household appliances and electronic equipment not currently covered by federal standards. The products covered under the new law include ceiling fans, ceiling fan light kits, furnace air handlers, commercial pre-rinse spray valves, commercial washing machines, refrigerators and freezers, icemakers, torchiere lighting, unit heaters, reflector lamps, metal halide lamp fixtures, pedestrian and vehicular traffic signal modules, exit signs, and very large commercial air conditioning units. In addition, the law requires the Secretary of State and the New York State Energy Research and Development Authority (NYSER-DA) to set efficiency standards for electronic products that use standby power when they are turned off but remain plugged in (e.g., DVD players and recorders, VCRs, and battery chargers) in an effort to reduce "phantom" energy consumption.

The appliance and equipment efficiency standards are expected to save 2,096 GWh of electricity annually, enough to power 350,000 homes. This equates

to annual savings of \$284 million per year. CO₂ emissions are expected to decrease by 870,000 metric tons annually, NO_x by 1,429 metric tons annually, and SO₂ by 2,858 metric tons annually as a result of the new standards (Pew 2005).

Web site:

<http://assembly.state.ny.us/leg/?bn=A08103>

What States Can Do

Depending on whether authority for efficiency standards already exists, states interested in exploring appliance efficiency standards can begin a new standards initiative, upgrade standards for products currently covered by state law, or expand coverage to new products.

Action Steps for States

States that have adopted appliance efficiency standards can conduct the following action steps:

- Assess whether authority exists to upgrade current standards or set standards for other products. If authority exists, determine appropriate increases in efficiency levels for current standards or appropriate new products and efficiency levels. If authority does not exist, work with policymakers to assess the benefits of allowing the implementing agency to upgrade standards and set standards for other products.
- Develop a list of potential products for which standards could be established and conduct an initial assessment of efficiency levels. Conduct a rulemaking process to determine the final products to cover and the associated efficiency levels. Encourage active stakeholder participation and use

transparent analysis and decision-making procedures.

- Periodically report on program impacts and operations.
- Assess stakeholder communication and participation and revise these processes, if needed.
- Actively promote consumer awareness of appliances for which EPA 2005 directs DOE to set standards.

States that are considering adopting appliance efficiency standards can:

- Review sample legislation, product lists, and analyses available from other states.
- Consult with stakeholders, national and regional associations, and other key parties to conduct preliminary cost/benefit and feasibility analyses.
- Work cooperatively with policymakers to determine whether appliance efficiency standards are an appropriate option.
- Actively promote consumer awareness about the energy cost savings and environmental benefits of appliance standards.

Information Resources

Information About States

Title/Description	URL Address
The California Appliance Efficiency Program. This Web site provides information and resources on California's appliance efficiency programs, including current regulations, rulemakings, a database of energy efficiency appliances, and background information.	http://www.energy.ca.gov/efficiency/appliances/index.html
California Appliance Efficiency Regulations. This Web site provides information on California's appliance standard regulations.	http://www.energy.ca.gov/appliances/2006regulations/index.html
California's Appliance Standards: A Historical Review, Analysis and Recommendations, Staff Report. CEC, Sacramento, 1983.	URL not available.
Energy Efficiency Standards: A Low-Cost, High Leverage Policy for Northeast States. The analysis conducted for this project showed that efficiency standards have very large and highly cost-effective economic, energy, and environmental benefits for states in the Northeast.	http://www.neep.org/Standards/Efficiency Standards Report.pdf
Energy Efficient Florida: Smart Energy Policy That Benefits Florida's Economy and Environment. This document provides information on Florida's clean energy potential.	http://floridapirg.org/FL.asp?id2=10282&id3=FL&
Report on Appliance Efficiency: Incentives and Standards. January 20, 2005. Presented by the Maine Public Utilities Commission (PUC) to the Utilities and Energy Committee, this report reviews alternative methods of using voluntary incentive programs and/or establishing minimum energy efficiency standards. It recommends that the Maine Legislature implement minimum efficiency standards for nine different products.	http://mainegov-images.informe.org/mpuc/staying_informed/legislative/2005legislation/appliance_standards_rpt.pdf

General Information About Appliance Efficiency Standards

Title/Description	URL Address
The American Council for an Energy-Efficient Economy (ACEEE). The ACEEE Web site contains many publications and resources on all aspects of energy efficiency, economic development, and environmental concerns.	http://www.aceee.org
The Appliance Standards Awareness Project (ASAP). This group provides information and resources on federal and states appliance standards.	http://www.standardsasap.org
Codes and Standards White Paper on Methods for Estimating Savings. Mahone, D., N. Hall, L. Megdal, K. Keating, and R. Ridge. 2005. April 7. Prepared by HMG for Marian Brown, SCE in Support of Statewide NRNC MA&E. This paper addresses California building and appliance energy efficiency standards, and the role of codes and standards programs as part of utility portfolios of energy efficiency programs.	http://www.calmac.org/publications/CSWhite_Paper_Final.pdf
The Collaborative Labeling and Appliance Standards Program (CLASP). This program's Web site provides information and resources on developing countries that are pursuing energy efficiency and labeling programs.	http://www.clasponline.org/disdoc.php3?no=289

Title/Description	URL Address
DOE Appliance and Commercial Equipment Standards. This DOE Web site provides information on state and federal appliance standards.	http://www.eere.energy.gov/buildings/appliance_standards/
Leading the Way: Continued Opportunities for New State Appliance and Equipment Efficiency Standards. Nadel, S., A. deLaski, J. Kleisch, and T. Kubo. 2005. January. This report describes opportunities for state governments to set minimum-efficiency standards for 18 appliances and other types of equipment currently not covered by federal standards.	http://www.standardsasap.org/a051.pdf
Northeast Energy Efficiency Partnerships (NEEP). NEEP's Web site provides information on promoting energy efficiency in the Northeastern United States.	http://www.neep.org
NEEP. Energy Efficiency Standards: A Low-Cost, High Leverage Policy for Northeast States. This Web site provides access to updated information about energy efficiency standards in the Northeastern states.	http://www.neep.org/Standards/index.html
Realized and Prospective Impacts of U.S. Energy Efficiency Standards for Residential Appliances. Meyers, S., J. McMahon, M. McNeil, and X. Liu. 2002. Lawrence Berkeley National Laboratory (LBNL). June. Final Report. This project involved development of an analytical framework to estimate energy, environmental, and consumer economic impacts of federal residential energy efficiency standards.	http://eappc76.lbl.gov/tmacal/esdocs.cfm?iddoc=1072
Smart Energy Policies: Saving Money and Reducing Pollutant Emissions through Greater Energy Efficiency. The report details nine specific policy recommendations that could have a substantial impact on the demand for energy in the United States while also providing positive economic returns to American consumers and businesses.	http://www.aceee.org/pubs/e012full.pdf
What Are Appliance Efficiency and Standards in the States? This DOE Web site provides information and resources on state appliance standards.	http://www.eere.energy.gov/state_energy_program/topic_definition_detail.cfm/topic=101

Examples of Legislation

State	Title/Description	URL Address
Arizona	Appliances and Equipment Energy Efficiency Standards. This bill sets minimum efficiency standards for 15 products.	http://www.swenergy.org/legislative/arizona/HB%202390%20Engrossed%20Bill%20Language.pdf
California	Appliance Efficiency Regulations, 2006. This document provides California's appliance efficiency regulations, and related public comments, hearing transcripts, and other information.	http://www.energy.ca.gov/appliances/2006regulations/index.html
Colorado	A Bill for an Act Concerning Energy Efficiency Standards for Specified Devices (HB 04-1183). This bill sets minimum energy efficiency standards for 14 products.	http://www.swenergy.org/legislation/colorado/HB-1183.pdf http://www.swenergy.org/legislation/colorado/HB-1183_FactSheet.pdf
Connecticut	An Act Concerning Energy Efficiency Standards, S.B.145. This act requires the Secretary of the Office of Policy and Management to establish, by regulation, minimum energy efficiency standards for certain heating, cooling, lighting, and other types of products.	http://www.cga.ct.gov/asp/cgabillstatus/cgabillstatus.asp?selBillType=Bill&bill_num=145&which_year=2004&SUBMIT.x=7&SUBMIT.y=7

State	Title/Description	URL Address
Maryland	Maryland House Bill 1030. This bill, which was enacted in January 2004, provides legislative language for Energy Efficiency Standards for 10 products.	http://mlis.state.md.us/2005rs/billfile/HB1030.htm
Massachusetts	Massachusetts Appliance Efficiency Standards Act. Commonwealth of Massachusetts. 2005. Chapter 139 of the Acts of 2005. This act requires establishment of minimum efficiency standards for five products.	http://www.mass.gov/legis/laws/seslaw05/sl050139.htm
New Hampshire	Minimum Efficiency Standards for Certain Products. Senate Bill 105 (S.B.105). State of New Hampshire. 2003. S.B.105-FN. Minimum Energy Efficiency Standards for Certain Products. New Hampshire appliance standards information. This bill, introduced in 2003, establishes state appliance and equipment energy efficiency standards for 10 products.	http://www.gencourt.state.nh.us/legislation/2004/sb0105.html
New Jersey	Establishes Minimum Energy Efficiency Standards for Certain Products. This act establishes minimum energy efficiency standards for eight products.	http://www.njleg.state.nj.us/ (To locate information about the Act, go to Select "Bills 2004–2005" from the left sidebar; select "Search by Bill Number;" and type "A516" into the search box.)
New York	Appliance and Equipment Energy Efficiency Standards Act of 2005. State of New York. 2005. Governor Pataki Introduces the Appliance and Equipment Energy Efficiency Standards Act of 2005. New York appliance standards information. This act establishes state energy efficiency standards for 14 household appliances and electronic equipment.	http://www.state.ny.us/governor/press/year05/april20_2_05.htm
Oregon	House Bill 3363. This act establishes minimum energy efficiency standards for 12 products.	http://www.leg.state.or.us/05reg/measures/hb3300.dir/hb3363.b.html
Pennsylvania	House Bill 2035. General Assembly of Pennsylvania. 2003. House Bill No. 2035. Providing for Minimum Efficiency Standards. Providing for Minimum Energy Efficiency Standards for Certain Appliances and Equipment; and Providing for the Powers and Duties of the Pennsylvania PUC and of the Attorney General. This provides the text for the Pennsylvania bill introduced in 2003.	http://www.legis.state.pa.us/wu01/li/bi/bt/2003/0/hb2035p4640.htm
Rhode Island	S 0540—Energy and Consumer Savings Act of 2005. This provides the text of the Rhode Island appliance standards legislation signed July 1, 2005.	http://www.rilin.state.ri.us/Billtext/BillText05/SenateText05/S0540A.pdf
Vermont	Senate Bill 52. An Act Relating to Renewable Energy Portfolio Standards, Appliance Efficiency Standards, and Distributed Electricity. State of Vermont. 2005–2006. Renewable Energy Goals. Vermont General Assembly, Montpelier. Vermont appliance standards information. This provides the text for the Vermont bill introduced in 2005.	http://www.leg.state.vt.us/docs/legdoc.cfm?url=/docs/2006/bills/senate/S-052.htm
Washington	Senate Bill 5098. An Act Relating to Energy Efficiency. Text of the Washington bill establishing minimum standards and testing procedures for 13 electrical products that are not covered by federal law.	http://www.leg.wa.gov/pub/billinfo/2005-06/Htm/Bill%20Reports/Senate/5098-S.SBR.htm
United States	Energy Policy Act of 2005. This is the text of EAct 2005.	http://frwebgate.access.gpo.gov/cgi-bin/getdoc.cgi?dbname=109_cong_bills&docid=f:h6enr.txt.pdf

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ACEEE. 2005b. The Federal Energy Policy Act of 2005 and Its Implications for Energy Efficiency Program Efforts. Steven Nadel, September 2005. Report #E053 ACEEE.	http://www.aceee.org/pubs/E053.pdf
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NEEP. 2005. Energy Efficiency Standards: A Boon for Maryland. Fact Sheet. Accessed November 9, 2005.	http://www.neep.org/Standards/FactSheets/MDfactsheet.pdf
Optimal Energy. 2004. Economically Achievable Energy Efficiency Potential in New England. Prepared by Optimal Energy, Inc. for NEEP. November 17.	http://www.neep.org/files/Executive_Summary.pdf
Pew. 2005. Pew Center on Global Climate Change Web Site. State and Local News. New York Adopts New Energy Efficiency Standards. Accessed November 9, 2005.	http://www.pewclimate.org/what_s_being_done/in_the_states/news.cfm
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